Consulting Engineer

Photo by Fabian Bachrach

November 1960

JOHN W. CRAMER, senior partner in Fulton & Cramer, of Lincoln, Nebraska, is expected to be the next president of the American Water Works Association. However, in spite of his strong interest in AWWA, Cramer believes that specialization is a luxury the consulting engineer in the less populated states cannot afford. As a general municipal consulting firm, Fulton & Cramer offers mechanical, electrical, and civil engineering services. Dealing mostly with small towns in the Midwest, Cramer believes that the consulting engineer must offer a personalized, well-rounded service. *Continued on page 10*

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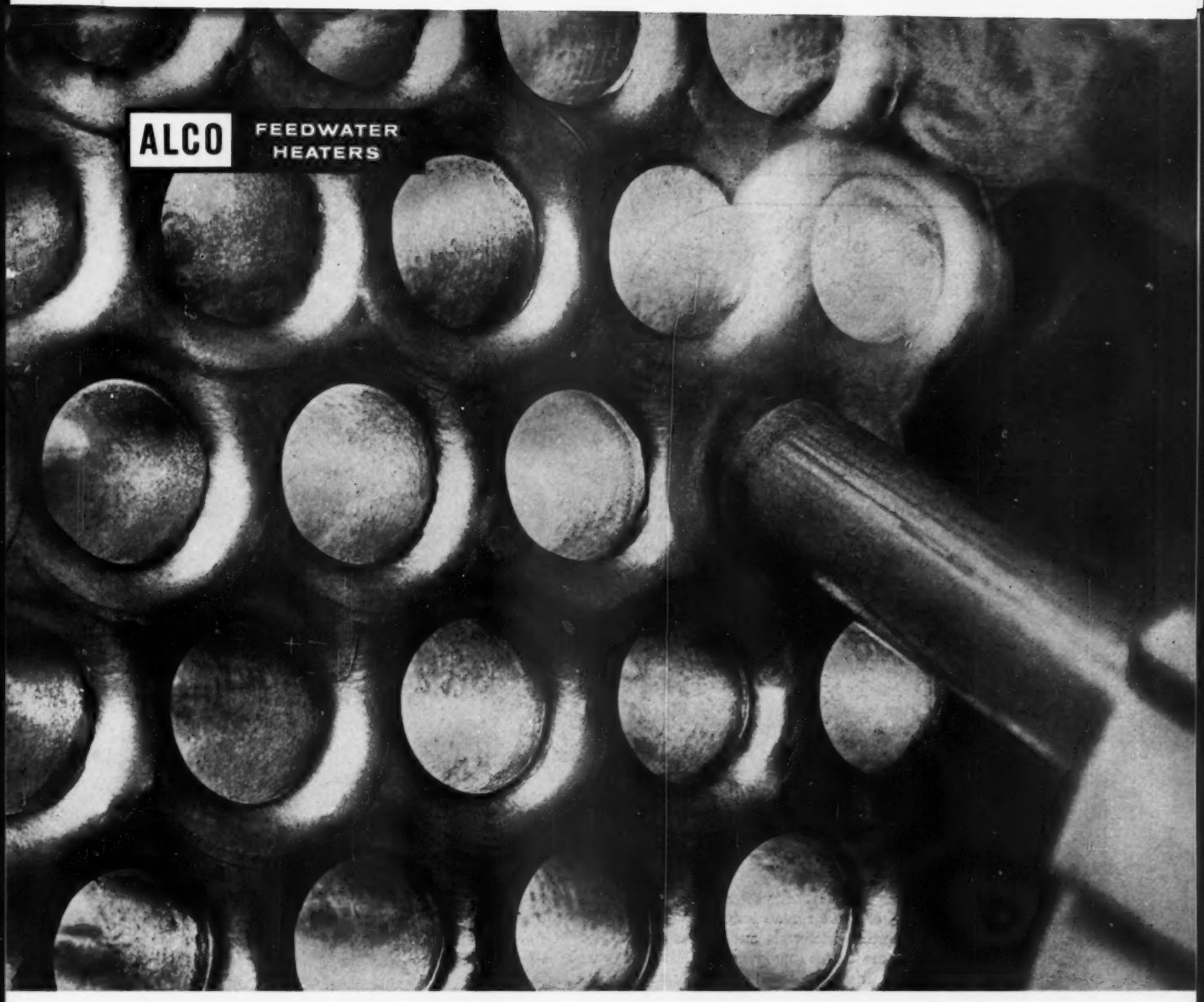

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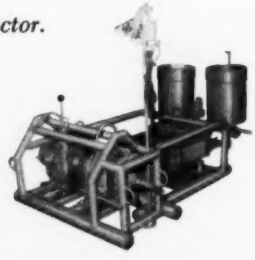

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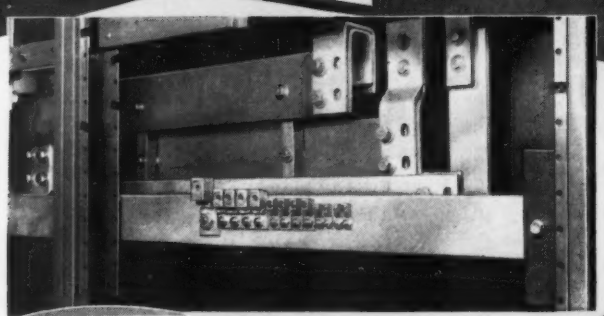

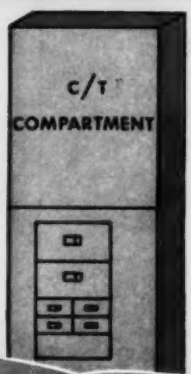

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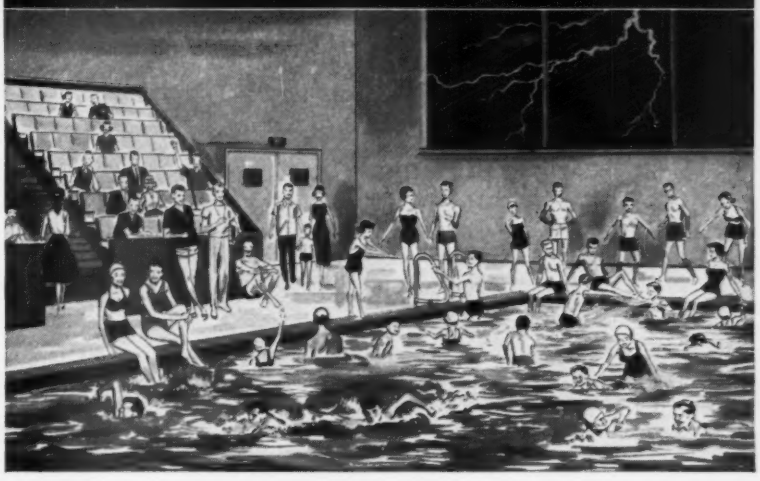

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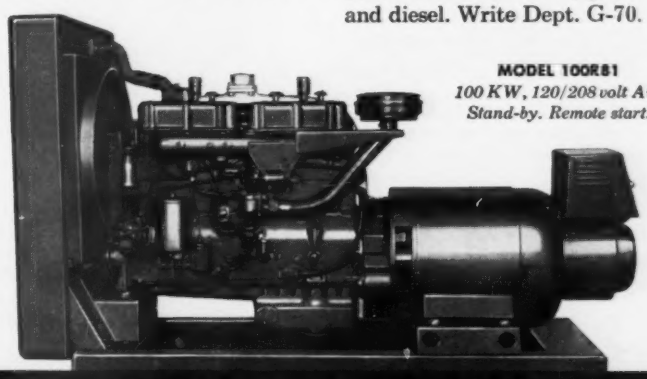

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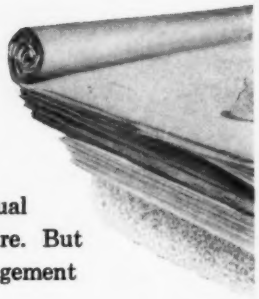
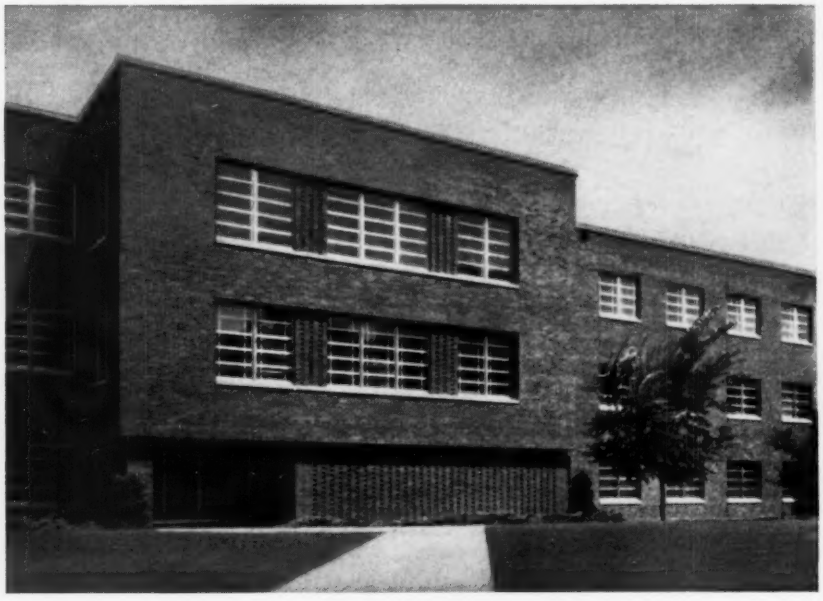
How *Imaginative Engineering* Uses Pneumatic Temperature Control To Guarantee Year 'Round Patient Comfort

Scott & Kinney, Kansas City consulting engineers, took a new look at an old problem and designed a *different* heating and air conditioning system for the University of Kansas Psychiatry Building. Their unusual method features two separate fan systems and a unique automatic damper application that eliminates the noise and distribution problems usually encountered with ordinary single-fan systems.



Providing uniform year 'round temperature together with foolproof individual room control has always been a problem in designing buildings of this nature. But Scott & Kinney provided the solution in their selection and imaginative arrangement of a Powers Pneumatic Control System.



Building "G", University of Kansas Medical Center

ARCHITECTS:
Kansas State Architectural Dept., Topeka, Kansas

CONSULTING ENGINEERS:
Scott & Kinney, Kansas City, Missouri

MECHANICAL CONTRACTOR:
A. D. Jacobson Plumbing & Heating, Inc., Kansas City, Missouri

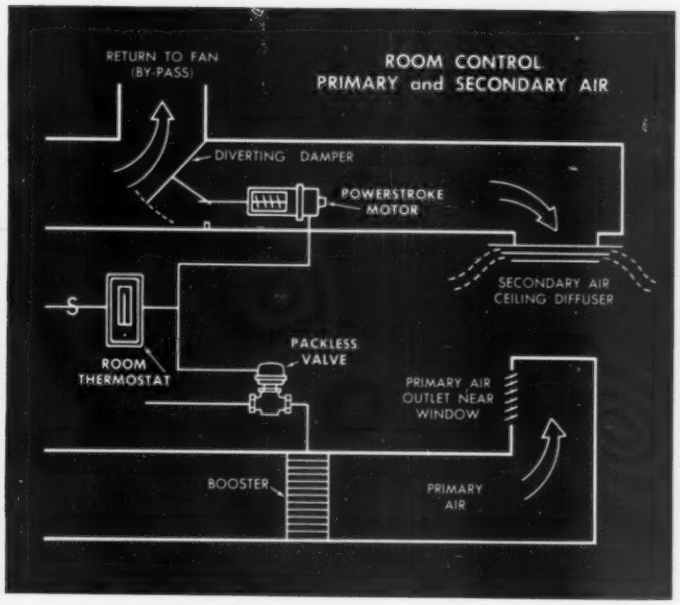
Final check on the U. of K. Psychiatry Building's pneumatic control system by the consulting engineers, Wilson O. Kinney (left) and Arthur R. Scott.

Heating, ventilating and air conditioning are accomplished through primary and secondary air systems. The primary system operates throughout the year, supplying a small amount of circulated air, including outside air. Final control in the primary system is a reheat coil — one for each patient room — using hot water with a Powers modulating packless valve.

Heart of the secondary — or booster — system is the automatic, quick-acting diverting damper. It permits both fresh and refrigerated air to pass into the individual rooms through a ceiling diffuser. When cooled air is not needed, it is diverted automatically by the damper into the ceiling plenum for return to the secondary fan.

To simplify individual room control of temperature, Scott & Kinney coordinated the actions of the reheat coil and the auto damper into a single control. One thermostat in each room controls both for maximum comfort.

This imaginative handling of standard Powers temperature control equipment is another example of problem-solving by the consulting engineer and the specialized help of Powers field engineers. The University of Kansas has reaped the benefits for the last four years — in comfort, operating economy and low cost maintenance.



For more ideas and technical data on Powers pneumatic temperature control equipment and systems, write for the latest Powers Catalog.

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John W. Cramer

– *Starts on front cover*

Next year, Cramer will step into a difficult position as AWWA president. The AWWA is comprised of manufacturers, consultants, utilities people, and anyone else who has an interest in water problems. Because of this, the technical education of members varies greatly. Some members want the AWWA to establish research facilities for certification of materials and expand all services to members. This involves money, and, as Cramer sees it, "the problem we must settle is whether the membership wants these expanded services enough to pay for them." Even with status quo, AWWA members soon will have to pay higher dues to meet inflationary costs.

Among the other groups in which Cramer is active is the National Society of Professional Engineers. He currently is vice chairman of Nebraska's functional section for engineers in private practice.

"Our functional section has accomplished exactly nothing. Right now, the group is concerned about standardizing fees. I think we should try to walk before we run. Why not tackle something like certification of contractors first? This should not be too difficult – state engineering departments have been doing it for a number of years."

Cramer, the only NSPE member in his firm, once tried to organize a chapter of the Consulting Engineers Council in Nebraska. He dropped the idea when a functional chapter began. "Too many functional section members are employees, and not more than half are consulting engineers. I would be willing to try again to organize a CEC chapter, because I think CEC is doing an excellent job as spokesman for the consulting engineer."

Cramer thinks more consulting engineers also should take an interest in the Engineers Council for Professional Development. He has served on accreditation teams several times and finds that, "Most of those who are establishing college curricula are teachers checking on each other. They appreciate consulting engineers who take the time to bring fresh and practical ideas to the schools. If consultants do not volunteer for such chores now, they will regret it in the not too distant future." Cramer also has conducted college seminars, and one of his prize possessions is a cigarette lighter given to him by an ASCE student chapter.

Cramer has definite ideas on engineering education, and has advised his son to get a degree in the humanities before entering engineering school. "I want to see future engineers get at least enough contact with the arts and sciences so that they can intelligently entertain themselves. Currently, young engineers have to learn any appreciation of art or literature after they graduate, and they are too preoccupied with furthering their technical education to take the necessary time for other studies.

"The professors are not at fault. Many of them also are concerned about turning out technicians instead of engineers, but industry has put pressure on the schools. I think that what industry wants is computer operators instead of engineers, and I think the consulting engineers should line up on the side of the educators in this battle."

Consultant Must Offer Personal Service

From his work for small cities, Cramer has come to feel that the consultant must do everything possible to make the mayors and the city council members realize that the consulting engineer, like other professionals, is offering a personal service. "When dealing with a doctor or an attorney, it is easy for a person to realize he is getting personal help. But it is difficult for the public to understand that when a bridge does not fall down, this too is the result of personal service."

Cramer's firm will not take a project on a contingency basis. "Even with the small client, it is both poor business and poor policy to do a free report in an effort to get a project. We usually work on a flat fee for preliminary studies, and our contracts have an escape clause for the client if he wants to stop the project at any time.

"An engineer has no right to say 'this is right, and this is what you need because I say so.' If a client cannot understand a preliminary report, the report is at fault. The engineer should not put himself into the position where he has to argue, or to plead his case. Reports written in layman's language will solve most problems." Cramer believes that the municipal consulting engineer has to show the client that he needs – and can afford – the project.

Fulton & Cramer has always been willing to participate in public hearings and has frequently been called on for court testimony. Most public meetings have one or two members in the audience who are against everything (such as the doctor in one small town who objected to sewer improvements because he was a big property owner and did not want to pay the assessments), but Cramer finds most municipal officials are prominent businessmen who have taken on their civic duties because of a feeling of responsibility and pride in their community.

Municipal Engineering not Political

In his dealings with municipalities, Cramer has run into the "package" sewage disposal plant problem. Although the package plants frequently are cheaper initially, Cramer seldom recommends them to his clients because of high maintenance costs. "We have had a little trouble with the package plant salesmen trying to go over our heads to the City

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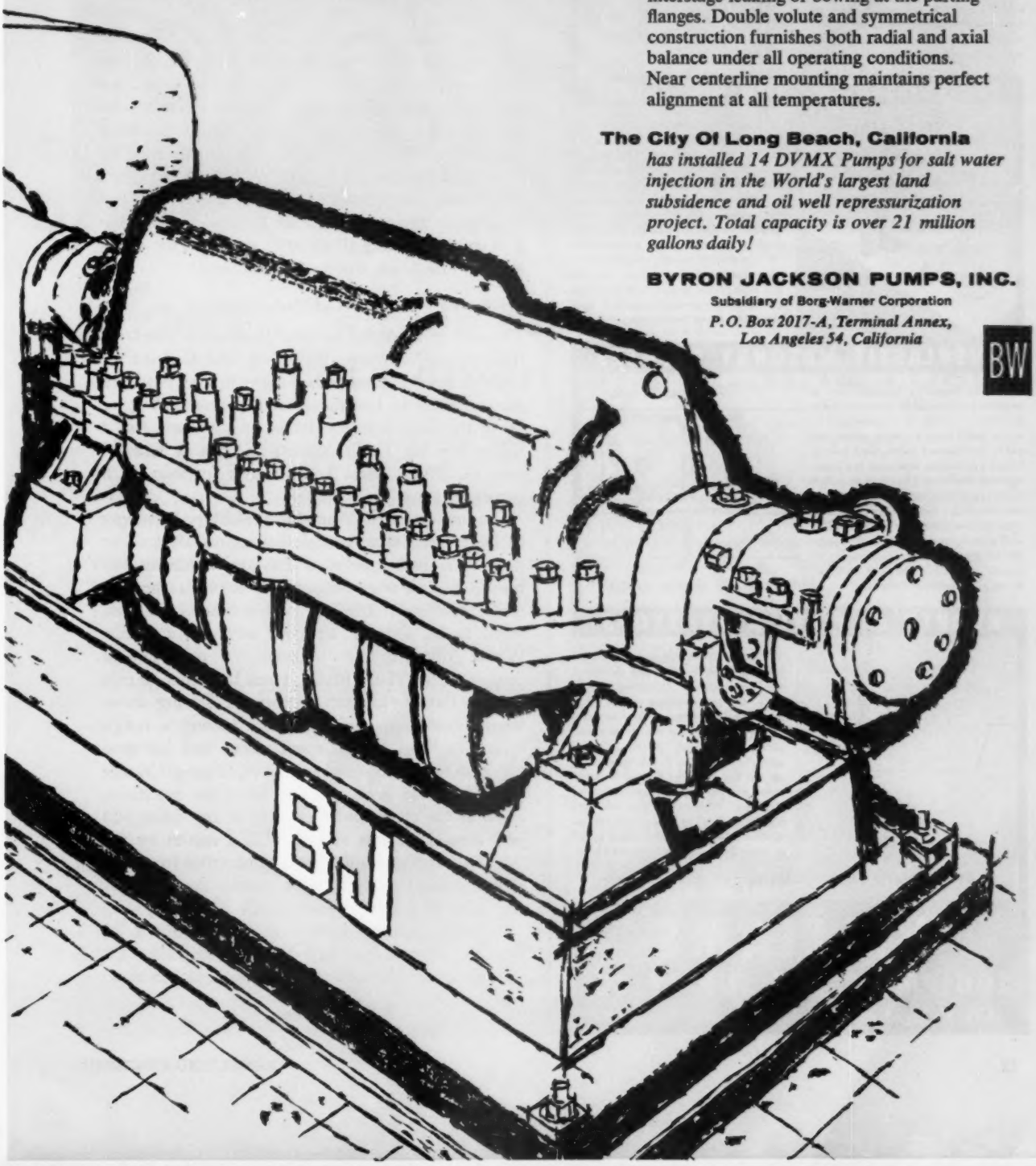

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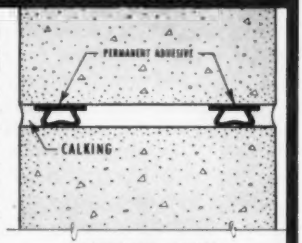

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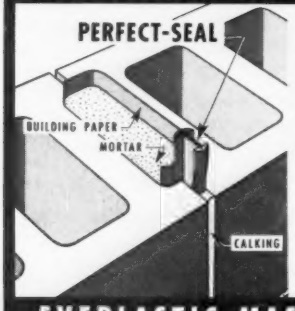

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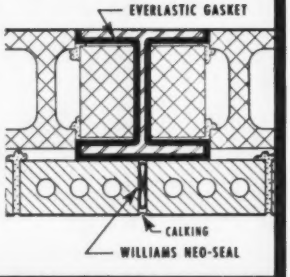
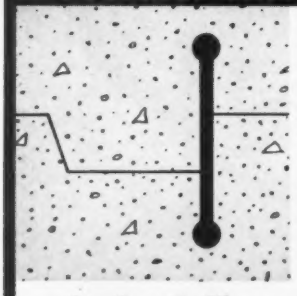


RUBBER or VINYL WATERSTOPS



Williams Waterstops are made from Natural Rubber Stock and designed for maximum effectiveness in any type of cast-in-place construction joint. They will bend around corners, and will not crack or tear from shear action. Tensile Test: 3990 lbs., Elongation Test: 650%. Available in rolls up to 80 feet in length. Molded union and junction fittings available. Williams Waterstops can be furnished in Vinyl or Neoprene for industrial uses where resistance to oil or other injurious wastes is desirable.

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Council, but we have never had a Council take a package plant against our advice." Cramer thinks consultants who do specify package plants should not charge fees as high as for a design with open specifications.

Cramer does not equate municipal engineering and "political engineering." During his entire career, he has "run into situations where bribes were suggested only two or three times, and in those instances we did not play the game. I do not want to sound smug, but I have just about come to the conclusion that political engineering must be a regional thing. I have read about it, and do not doubt that it is a problem in some parts of the country. But not in Nebraska."

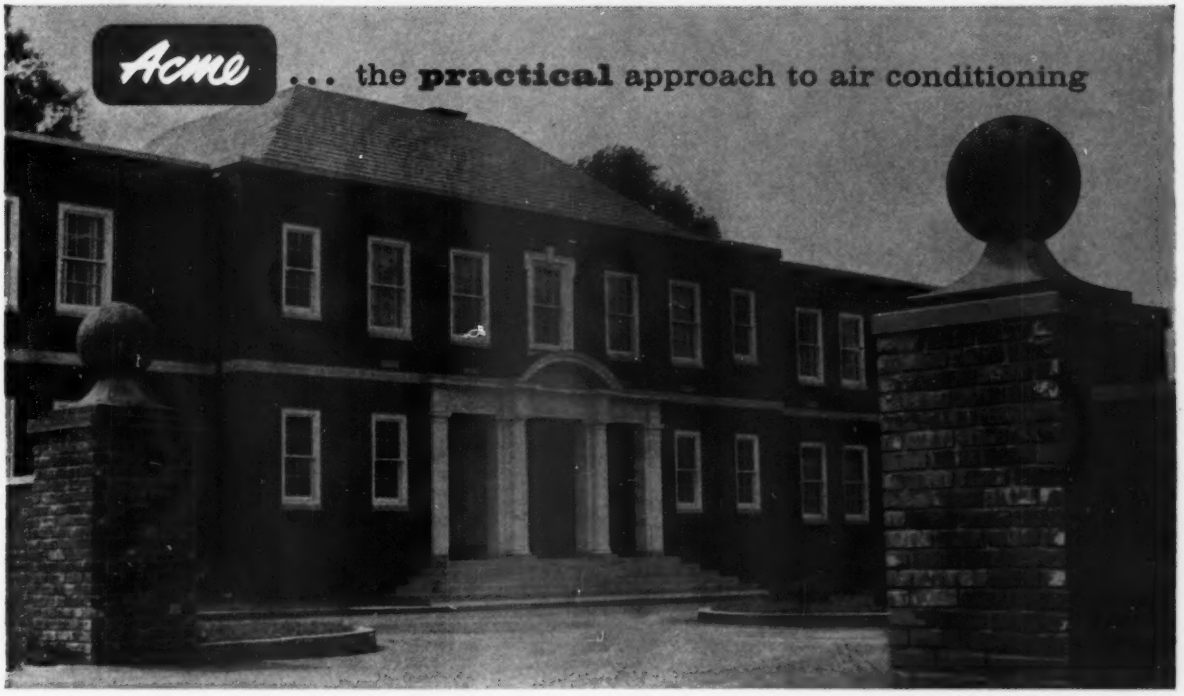
Cramer's good fortune has not been simply in business. He has been personally lucky too. A few years ago, he had a ticket out of Denver on the flight that was bombed by a passenger's son-in-law. Cramer missed connections by 15 minutes, and was a little miffed at the airline. Coming to New York City for the CONSULTING ENGINEER cover story interview, Cramer took the O'Hare-Midway helicopter flight immediately preceding the one that crashed, killing all aboard (including the president of the Iowa Engineering Society).

Engineering Interest Had Early Origin

The son of a contractor who built grain elevators throughout Nebraska, Wyoming, and Colorado, Cramer does not remember when he did not have the ambition to become a civil engineer. "I grew up in the days before child labor laws, and was a water boy for Dad's construction teams when I was 14. Three years later, I was foreman of a carpenter gang."

Cramer attended Wentworth Military Academy at Lexington, Missouri, graduating in 1933. "The depression had a delayed reaction in hitting Nebraska, but we were feeling it by the time I got out of the Academy." Turning down a chance to attend West Point, Cramer went to work on a Public Works Administration hydroelectric development project on the Platte River. It was here that he met Robert Fulton, his future partner. During those years, consulting engineers were having a rough time of it, and Fulton spent about half his time supervising work on the project. Young Cramer worked in the field, ran the blueprint machines, acted as file clerk, and took care of any other odd jobs around. "I was making $125 a month by the time I quit – and later, after graduating from college I started at $138. This clearly demonstrates the value of a college education!"

By 1937, Cramer decided he could afford to go back to school. He quit his job, married, and started at the University of Nebraska in the same



Architects, Nevin & Morgan, Louisville

Acme... saves on installation ...cuts down on running costs

Resounding is the only word for the chorus of "ayes" in favor of the Acme air conditioning system now comfort cooling the Carver School of Missions & Social Work at the Southern Baptist Theological Seminary, Louisville, Kentucky.

Roy B. Sanders, mechanical contractor, is an old "Acme hand", having installed Acme units in the Kentucky State Police Barracks and Municipal Building, Frankfort General Hospital, Louisville, in addition to this job. And according to Roy "Acme is outstanding because it comes in smaller packages than any other equipment of comparable efficiency . . . it's simple to handle, simple to install. In fact, counting materials and man hours, Acme saves me about 10% on installation."

E. R. Ronald, consulting engineer, states "Acme equipment easily fits the architectural specifications we have to follow and we consider it the equal of any more publicized unit in the country."

And the end consumer? Michael L. Speer, Director of Administration for the School says "*Acme couldn't be surpassed for a private institution* such as Carver School. It supplies a maximum of comfort with a minimum of operation. It cuts down on running costs."

Why not join the ranks? There's an Acme sales engineer near you who'll be happy to "sign you up".

Acme INDUSTRIES, INC.

JACKSON, MICHIGAN • GREENVILLE, ALABAMA

MANUFACTURERS OF QUALITY AIR CONDITIONING AND REFRIGERATION EQUIPMENT SINCE 1919

GRID's got to be good!

ABBOTT LABORATORIES
ALLEGHENY LUDLUM
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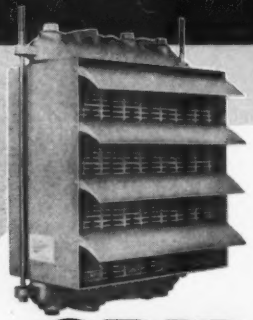

The best guarantee any product can have is its users.

LOOK at the plants that depend upon

GRID ▶ UNIT HEATERS
BLAST HEATERS
RADIATORS

for a trouble-free, low maintenance cost heating system - One that will serve without service - Installations made in 1929 are still operating without need for repairs. GRID'S design and construction makes the difference!

GRID Cast Iron Construction resists corrosion externally from acid fumes and internally from electrolysis. No leaking from rotted cores.

GRID one-piece cast iron heating sections and headers are leak-proof on steam pressure up to 250 p.s.i. 450° temperature. Smaller steam lines cost less.

GRID heating sections with widely spaced fins cast integral with steam chambers are easy to clean - Will not "mat" on air intake side.

GRID design develops low outlet temperatures and, with proper fan volumes, delivers warm, comfortable air to floor - No wasted heat at ceiling.

Get complete information on a GRID System for your plant. Write for catalog #956 GRID CAST IRON STEAM HEAT TRANSFER SURFACE.

Representatives in principal cities

BAKELITE CO. B & O R.R. EVERETT PULP & PAPER CO. GENERAL ANALINE & GENERAL CHEMICAL DIV. AMERICAN CHAIN & CABLE AMERICAN CYANAMID CO. ARMCO STEEL CORP. ARMOUR & CO. AMERICAN STEEL & WIRE CO. ANACONDA COPPER MINING CO. ANSUL CHEMICAL CO. ARMSTRONG CORK CO. ALLIED CHEM. & DYE CORP. ALLIS-CHALMERS MFG. CO. AMERICAN MACH. & FOUNDRY CO. AMERICAN RADIATOR & STD. SAN. ANCHOR HOCKING GLASS CORP. GENERAL FOODS CORPORATION GENERAL ELECTRIC CO. INLAND STEEL ILLINOIS CENTRAL R.R. CO. MINNESOTA MINING & MFG. CO. NEW YORK CENTRAL R.R. CANADIAN PACIFIC RWY. CO. KRAFT FOODS CHAIN BELT CO. CHESAPEAKE & OHIO R.R. MAINE CENTRAL R.R. CO. CHICAGO NORTH WESTERN R.R. CHRYSLER CORP. CLIFFS CONSOLIDATED WATER POWER & PAPER CO. CELOTEX CORP. CMSTPP&P RR VICTOR CHEMICAL WORKS CUDAHY PACKING CO. WHEELING STEEL CORPORATION INTERNATIONAL SHOE CO. CONSOLIDATED MINING & SMELTING CO., LTD. SINCLAIR REFINING CO. CARNEGIE ILLINOIS STEEL CO. COLUMBIA SOUTHERN CHEMICAL CORP. OLIN-MATHIESON CHEMICAL CORP. UNITED ELECTRIC COAL CO. NATIONAL LEAD CO. ALLIED CHEM. & DYE CORP. NATIONAL ANILINE WEST VIRGINIA PULP & PAPER CO. LITHIUM CORP. MORTON SALT CO. HERCULES POWDER FALK CORPORATION PENNSYLVANIA SALT MFG. CO. U. S. RUBBER CO. PHILLIPS PETROLEUM CO. GREAT NORTHERN RAILWAY WASHINGTON TERMINAL CO. WESTINGHOUSE UNION CARBIDE & CARBON E. I. DuPONT de NEMOURS INC. ELECTRIC AUTO LITE CO. MASONITE CORP. YOUNGSTOWN SHEET & TUBE CO. GENERAL TIRE & RUBBER CO. INTERNATIONAL PAPER CO. A. O. SMITH CORPORATION BETHLEHEM STEEL CORP. MONSANTO CHEMICAL CO. BENZOL PRODUCTS NORTHERN PACIFIC R.R. CO. BENDIX CORP. STANDARD OIL CO. FORD MOTOR CO. WILLPUTTE COKE OVEN DIV. DIAMOND ALAKALI CO. BUCKEYE COTTON OIL CO. B. F. GOODRICH HOFFMANN La-ROCHE INC. BEATRICE FOODS DAVISON CHEMICAL CORP. GOODYEAR HARSHAW CHEMICAL CO. STAUFFER CHEMICAL INTERNATIONAL HARVESTER BORDEN CO. MINN. & ST. LOUIS R. R. CO. LOUIS ALLIS CO SINCLAIR REFINING CO.

D. I. MURRAY MANUFACTURING CO.
Manufacturers Since 1883
WAUSAU, WISCONSIN

week. During college, he worked part-time for Fulton, and four years later was graduated with a Bachelor of Science degree in Civil Engineering.

War Creates Career Confusion

California grass looked bright green in those days – after the depression in Nebraska – and Cramer took a job with Lockheed in Burbank. Soon World War II started, and Cramer wanted to join the Army but discovered he was "frozen" in his job.

Again Fulton came into Cramer's life. He called to say he was working with another Lincoln firm, Davis & Wilson, architects and engineers, on a $15 million project at Buckley Field, Colorado, and they wanted Cramer on the project. For this, he left Lockheed, thinking that the new project would occupy the short interim before his reserve commission would get him into active duty.

At the end of a year, when the project was completed, Cramer was ordered to duty as a Lieutenant in the Corps of Engineers. He was sent to Fitzsimmons General Hospital in Denver for his physical. There he stayed for 21 days waiting for assignment. This was too long, for Lockheed found him.

"I really have no complaints about the way I was treated at Lockheed. They say young engineers start on the drafting board and never get a chance to go further. I began as a junior detail draftsman on aircraft design and by the time I left Lockheed in 1944, I was the youngest full design engineer (29) at the company and was responsible for fuselage design of all models at this plant."

Back to Consulting

At the end of the War, Cramer resigned at Lockheed and took a job as chief engineer in charge of product design for Chemold Company, which handled resin bonded fabric laminates and tooling. A year later, Fulton called and suggested Cramer come back to Lincoln as a partner in his firm.

"I'll never forget the first project I handled after going back to Lincoln. It was not too large – only $75,000 – but it was typical of the work we do. The small town of Hyannis, Nebraska (Pop. 400) wanted to modernize their electric generating plant. I handled the design and installation of a diesel for them. Of course, as clients, many of these small towns are not the financial risk they might appear. For example, although Hyannis has a population of only 400, it has 12 millionaires."

Just one year after Cramer joined the firm, Fulton had a serious heart attack. Although he did not feel he was ready to run the firm, Fulton had full confidence in him, and Cramer has been in charge ever since.

Municipal engineering is a rewarding field, according to Cramer. "Sidney, Nebraska, is one of

Impartial tests by university research engineers prove Dur-o-wal adds 71% flexural strength to masonry walls

We sent Dur-o-wal masonry wall reinforcement to school—where its effectiveness was scientifically measured by strictly impartial university research engineers. Here are facts:

When Standard Weight Dur-o-wal is used every second course, the flexural strength of a masonry wall increases 71 per cent. This can be further increased, in the good cause of permanent wall construction. When Extra Heavy Dur-o-wal is used every course, with Class A mortar, the flexural strength of a masonry wall increases 261 per cent!

Dur-o-wal, you see, is engineered—according to the fundamental truss principle which uses all of the steel in tension and working together. Make sure you get the masonry wall reinforcement that does the job. Always look for Dur-o-wal's exclusive trussed design. Stocked by more than 8,000 nation-wide dealers. See us in Sweet's!

RAPID CONTROL JOINT
...another product engineered for the job by the makers of Dur-o-wal. Wide, weatherproof Neoprene rubber flanges expand and contract with the joint, keep it sealed tight with little or no caulking.

DUR-O-WAL®

Masonry Wall Reinforcement and Rapid Control Joint

RIGID BACKBONE OF STEEL FOR EVERY MASONRY WALL

DUR-O-WAL MANUFACTURING PLANTS

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- Dur-O-wal Prod. of Ala., Inc., Box 5446, **BIRMINGHAM, ALA.**
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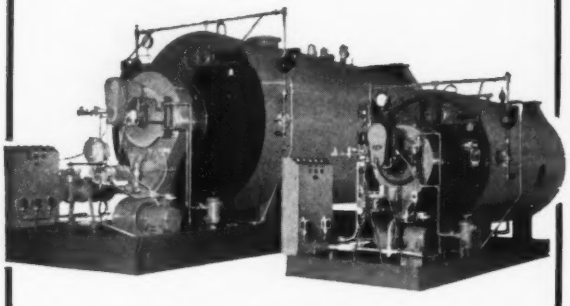
PACKAGED BOILERS

BY

Johnston

PIONEERS OF
WATER BACK BOILER DESIGN



For the Engineers who demand performance standards which assure longlived dependability and sustained operating economy.

SPECIFICATION FEATURES

1. *Submerged rear combustion chamber* and three pass design eliminates tile baffles and rear-end refractories with their inherent maintenance costs.
2. *Completely assembled package,* from a single source, for undivided responsibility and fast easy installation.
3. *Five square feet* of heating surface per boiler horsepower, ASME standard, for optimum heat transfer and lower maintenance.
4. *Factory fire testing* checks performance and proves efficiency before shipment. Purchasers are welcome to witness these tests.
5. *Johnston starting and field service* by trained technicians and thorough operator training assures lasting customer satisfaction.

Johnston Packaged Boilers are available in sizes from 20 to 750 H.P., 15 to 250 lbs. working pressure. Quiet, dependable burners for cold oils, preheated oils, gas or fast, easy changeover gas-oil combinations.

For complete information consult your nearby Johnston Representative or write to Johnston Brothers, Inc., Ferrysburg, Michigan.

JOHNSTON BROTHERS, INC.

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Building Quality Boilers Since 1864

our clients. When we started planning with them for present and future needs, the town had a population of 3000. Then came the oil boom, and in only a few years the population rose to 10,000. We have helped them grow, and just completed the largest diesel power plant in Nebraska for them. They have a progressive city government. Although careful to prevent getting the town too deeply in debt, the Council does not discourage progress. This town is typical of our municipal clients. More than 95 percent of our work is repeat business."

Another example is Lyons, Nebraska, which has been a client of Fulton & Cramer since 1919. The city government has changed many times, but the consulting engineer firm has not. "We like returning to clients. It keeps our work standards high, and we take personal pride in helping towns."

Wide Variety of Projects

Fulton & Cramer handles investigations, reports, design, and supervision of construction for water and sewage works, paving, gas systems, electric generation, and distribution. And not all of their projects have been small. For instance, the firm handled full utilities for the Capehard Housing Project (600 homes) near Lincoln. They also have done much of the municipal engineering for Lincoln, including 11 wells in the Platte Valley and an extension to the water treatment plant.

On electrical projects, Fulton & Cramer likes to point out that, "When we first began the practice of professional engineering, most towns below 500 population had no electric system, many towns in the 500 to 1500 size had electric service but it was limited to the period from dusk to 10 or 11 p.m., and the larger cities and towns had electric plants with 24-hour service. Most electric customers had only one drop cord light to a room, and modern appliances were unknown.

"In almost all towns, street lighting was meager and usually limited to a so-called 'moonlight' schedule – that is, the street lights were turned off when the moon provided any light." Since then, Fulton & Cramer has handled almost every kind of electric system.

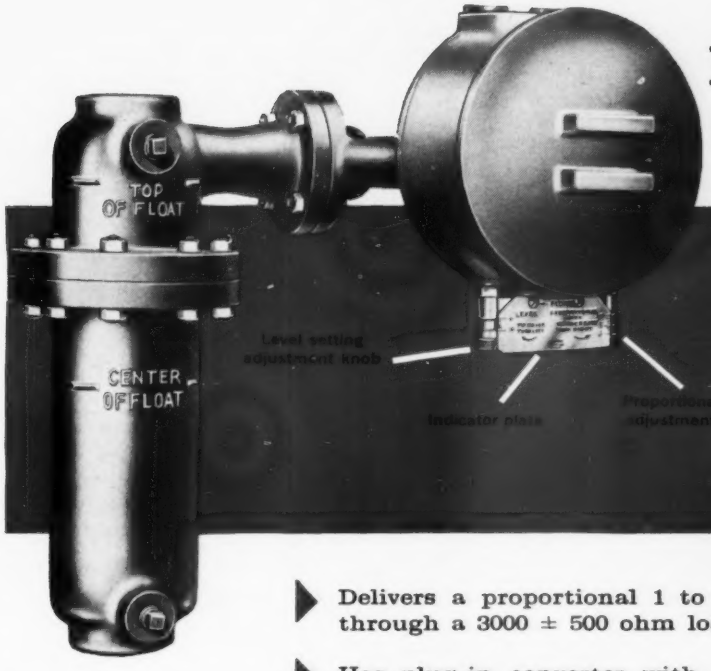
"We have acted as engineers for practically every city in the state where the purchase of existing gas systems has been accomplished or is now in progress. We designed the one gas distribution system originally built by a municipality and have served as engineers for the Federal government and many cities in constructing or enlarging gas facilities."

Firm Promotes Employee Professionalism

With a staff of seven, Cramer is concerned about his men's professional development. His engineers rotate between field and office work, and because

NOW FISHER LEVEL-TROL®

FOR ELECTRONIC SYSTEMS

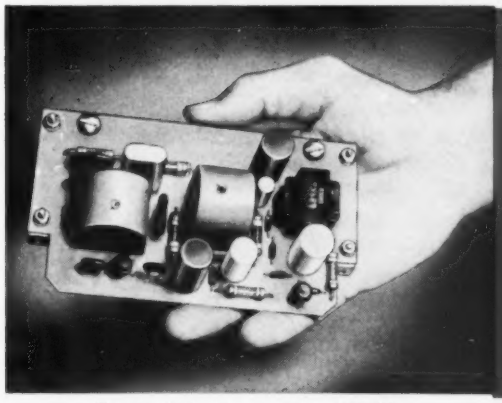


Quick accurate external adjustment

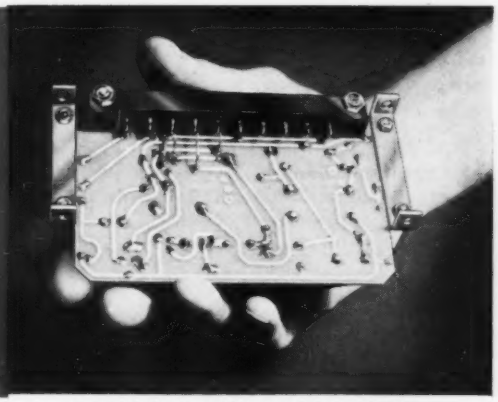
- **Delivers a proportional 1 to 5 milliampere dc signal through a 3000 ± 500 ohm load.**
- **Has plug-in converter with printed circuit. Conventional leads and unnecessary wiring are eliminated.**

This Fisher explosion-proof Electronic Level-Trol features external adjustment for proportional band and liquid level height, and incorporates extreme simplicity of design throughout. Silicon transistors and diodes are used instead of the conventional vacuum tubes. You do not need any additional parts to reverse action of the unit. With only .25% effect from ±15% supply voltage change, line voltage fluctuation is of negligible effect.

Fisher Bulletin F-85 will give you complete details on the Fisher Type 2300 Electronic Level-Trol. Send for it.



Plug-in electronic converter assembly.



Printed circuit of the converter assembly.

IF IT FLOWS THROUGH PIPE ANYWHERE IN THE WORLD . . . CHANCES ARE IT'S CONTROLLED BY . . .

FISHER GOVERNOR COMPANY

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CONTINENTAL EQUIPMENT CO. DIVISION, Coraopolis, Pennsylvania

FISHER® Controls

SINCE 1880

SPECIFY

Gary

WELDED STEEL GRATING

with the hexagonal cross bars

Tested and proved in millions of square feet! Used under all conditions, for open flooring and stair treads, Gary's hexagonal cross bar design and square edge strip assure a more durable, safer, neater grating. Pressure welded construction forms cross bars and main bars into a rugged one-piece grating. Tops of all bars are flush.

Pre-cut to your specifications. Whatever your needs in type and size, factory-fabricated Gary Grating saves you installation time and money. Careful quality control assures dimensional stability, long life and neat appearance.

Gary Grating can also be furnished in a variety of stainless steels and aluminum.

Specify Gary Grating . . . either in steel or aluminum . . . for all your functional and decorative grating and stair tread requirements. Write today for free catalog — Dept. K-7, 4045 E. Seventh Ave., Gary, Indiana.

ROCKWELL-STANDARD CORPORATION

Grating Division, Gary, Indiana

of the diversity of the projects, the men must be able to either head a project (if it is primarily in their field) or work under others.

Employees also are encouraged to register and to join their respective Founder Societies. "I insist the men pay their own initial registration or membership fees, because I feel this will give them greater appreciation of the organization. However, we are happy to pay annual dues or fees for our people after they have taken this first step. Also, we encourage them to attend conventions on our time and money."

Cramer practices his theories on professionalism. For many years, he has been active in AWWA, and he was the winner of the George Warren Fuller Award for outstanding service to the profession in 1954. He has also served on Nebraska committees studying the problem of relocation of highway utilities. There is no pat answer to the question of who should pay for relocation, and Cramer's committee has tried to settle each case on its merits. "All utilities think the highway rights-of-way are natural rights-of-way for them. Yet, the highway people do not like having utilities on their property and take the attitude that since the utilities are there on suffrance they can move themselves."

Water Is Cramer's Specialty

"Water works is a field that will show tremendous growth in the near future. For many years, an engineer had to be concerned only with providing safe and potable water. Now, because the public has become more discriminating, taste, turbidity, and hardness also must be taken into consideration. It is now possible, and indeed our duty, to provide quality water."

Cramer thinks water will be a source of increasing controversy in the future. "Users are competitive, and the situation is going to get worse rapidly. It is becoming increasingly accepted that agriculture comes first in the use of water, but air conditioning and industrialization will make more and more demands on available supplies. We are going to have to work on the principle that no one has a right to waste water, and that all who use air conditioning have a duty to plan for maximum reuse of water."

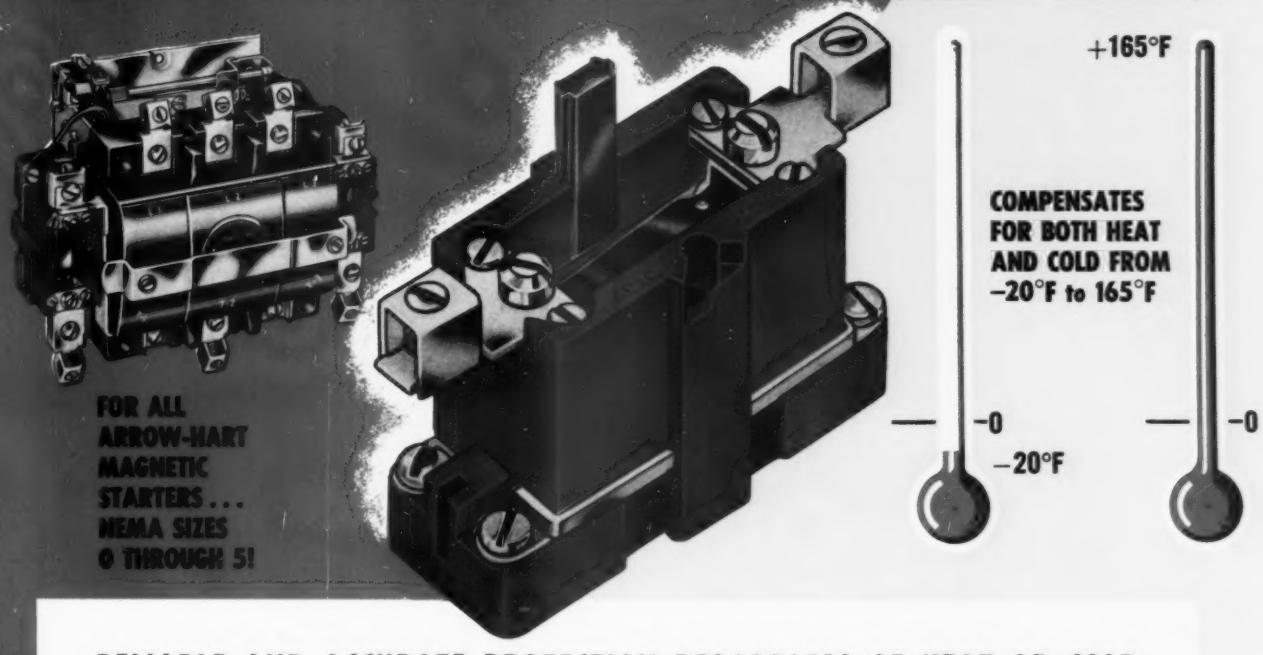
Radioactivity is a new problem affecting water supply. All streams have a higher radiation level than in the past, "but no stream has been tested and found dangerous." A nuclear plant near Lincoln had caused undue concern among nearby residents. Wastes from the plant are transported elsewhere, but the residents were sure their water must be contaminated. After a study, Cramer found the water untainted, and "our only problem was to convince the people there was no problem." ▲▲

ANNOUNCING

Something NEW under the sun

the ARROW AH HART

AMBIENT COMPENSATED OVERLOAD RELAY


+165°F
COMPENSATES FOR BOTH HEAT AND COLD FROM −20°F to 165°F
−0
−20°F
−0
FOR ALL ARROW-HART MAGNETIC STARTERS . . . NEMA SIZES 0 THROUGH 5!

RELIABLE AND ACCURATE PROTECTION REGARDLESS OF HEAT OR COLD

Here, for the first time, is a compact overload relay that compensates for both heat and cold, operating on the same time curve at all temperatures from -20° F to 165° F. Compensation is completely automatic. No field adjustment is needed. Operating mechanism is simple, rugged and dependable.

This performance is made possible by the exclusive Arrow-Hart "Balancing Bi-Metal" which is located in a separate compartment and is not; therefore, affected by heat applied to the working bi-metal.

- **MUCH SMALLER SIZE** . . . than any other comparable unit now available. Base size is the same as standard A-H Overload Relays.
- **USES STANDARD HEATERS** . . . and works equally well with either quick-trip or regular type.
- **COMPENSATES AUTOMATICALLY** for both heat or cold, by means of an exclusive, "Balancing Bi-Metal" Effective through a temperature range from —20° F to 165° F.
- **DEPENDABLE IN OPERATION** . . . and requires no adjustments of any kind.
- **AVAILABLE** . . . with all A-H Starters. Ratings from 25 to 300 amperes, continuous current. Normally supplied with manual reset. If desired, relays can be equipped with a change-over lever that provides manual or automatic reset, as required.

IDEAL FOR USE . . .

OUTDOORS . . . in oil fields and other installations subjected to wide seasonal or daily changes in ambient temperatures.

INDOORS . . . for control installations located near boilers, furnaces, heating units or refrigeration equipment and subjected to wide daily changes in ambient temperature.

SEE NEXT PAGE FOR CONSTRUCTION DETAILS and ADDITIONAL DATA . . .

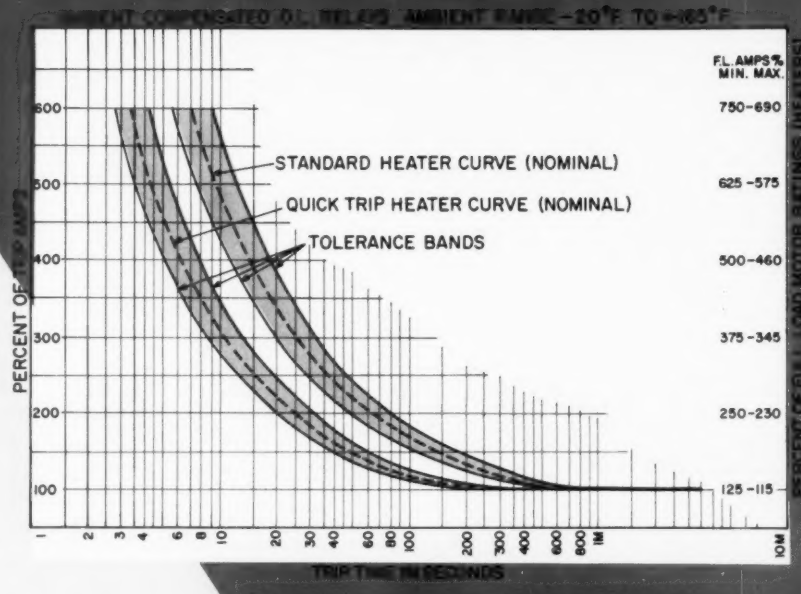
THE ARROW-HART & HEGEMAN ELECTRIC CO., HARTFORD 6, CONNECTICUT

AMBIENT COMPENSATED OVERLOAD RELAYS

WITH "BALANCING BI-METAL"

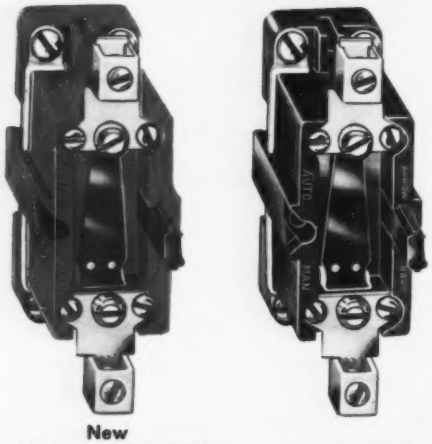
DEPENDABLE, AUTOMATIC COMPENSATION for A WIDE RANGE OF TEMPERATURE CHANGES

As shown in the accompanying drawing, the working bi-metal and the compensating bi-metal are identical in size and construction and are joined by a coupling bar. As the ambient temperature rises above 72°F, the compensating bi-metal operates through the coupling bar to move the working bi-metal in order to maintain its distance from the trip arm. Similarly, as the ambient temperature falls below 72°F, the compensating bi-metal operates to maintain its distance from the trip arm. Therefore, tripping time remains the same regardless of temperature. Switching mechanism itself employs the same positive snap-action featured in all Arrow-Hart Overload Relays. The calibrating screw permits precise setting. This screw is set and sealed at the factory and requires no further adjustment.



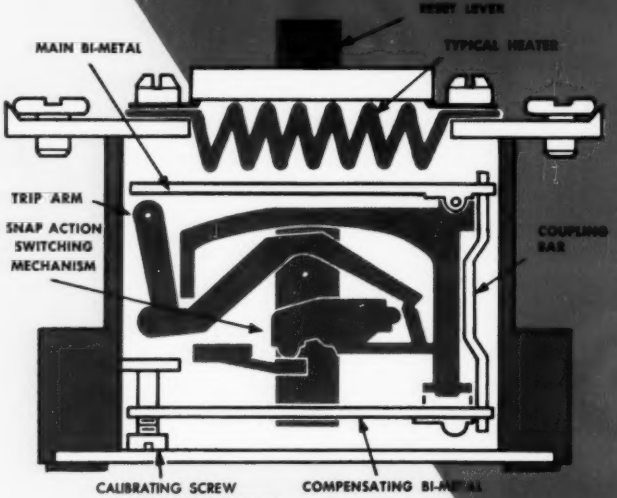
SEND NOW FOR COMPLETE INFORMATION

COMPARABLE IN SIZE TO STANDARD ARROW-HART O.L. RELAYS



New Ambient Compensated O.L. Relay

Standard O.L. Relay



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OPERATES ON THE SAME TIME CURVE AT ALL TEMPERATURES FROM —20° F TO 165° F!

THE ARROW-HART & HEGEMAN ELECTRIC COMPANY
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MOTOR CONTROL DIVISION

Please send me complete information on the new Arrow-Hart Ambient Compensated Overload Relays with exclusive "Balancing Bi-Metal" Mechanism.

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ARROW AH HART

Quality since 1890

MOTOR CONTROLS · ENCLOSED SWITCHES
APPLIANCE SWITCHES · WIRING DEVICES

St. James Episcopal Church, Dallas, Texas. Designer: Jack Hemphill

Now we're cooling with GAS!

It's comfortably cool in this strikingly modern church—even with the Texas sun burning against its tall and beautiful glass wall. The system is the most modern, too—an Arkla-Servel gas air conditioning unit.

After careful study backed with successful experience in previous jobs, the architect specified gas and Arkla. "The main reason is performance. What could be easier. You just set it, and forget it. Of course, economy plays a big part, too... but basically it's the trouble-free operation."

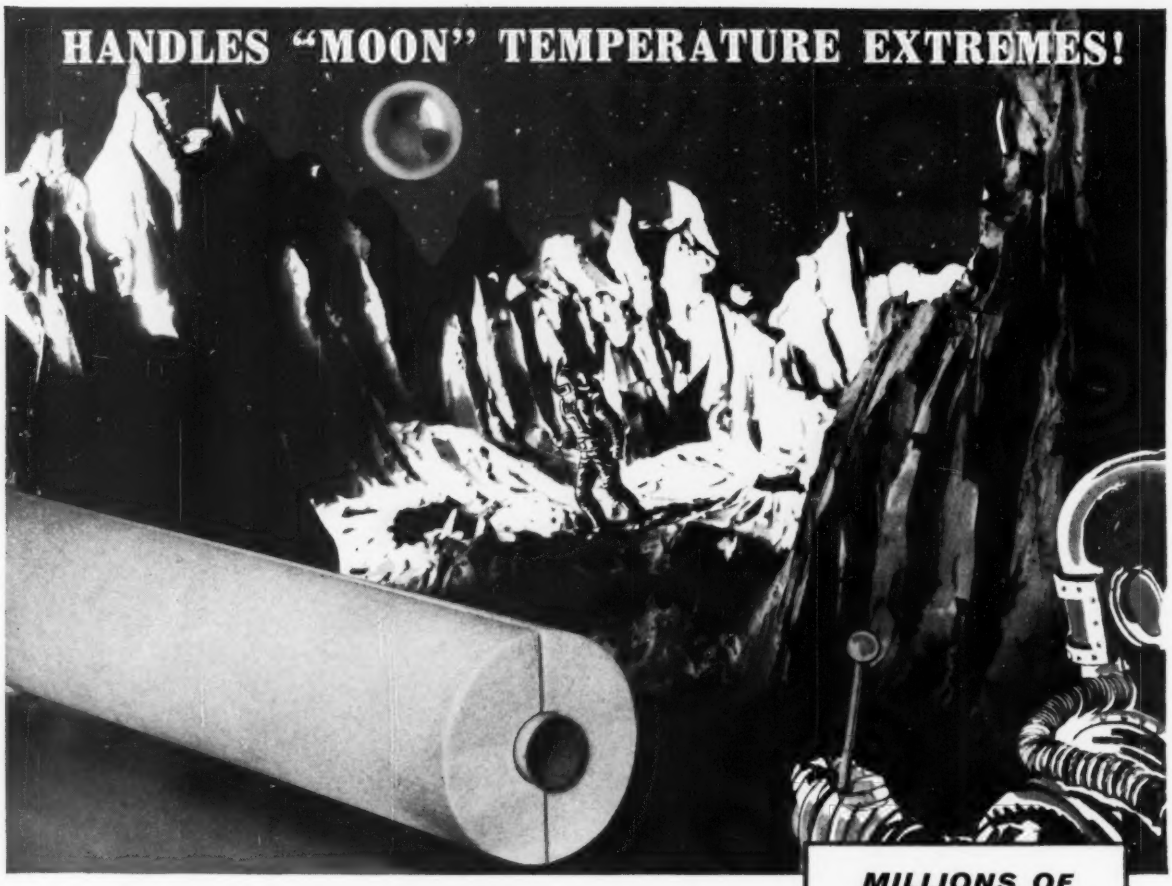
You or your clients can have this same efficient year 'round operation. For specific information, call your local gas company, or write Arkla Air Conditioning Corporation, General Sales Office, 812 Main Street, Little Rock, Arkansas.
American Gas Association.

Gas-operated Arkla-Servel Air Conditioning Units
• lowest operating costs • fully automatic operation
• long dependable service • packaged construction
• compact size • easy installation

Three 5-ton Arkla-Servel Sun Valley Gas units heat in winter . . . cool in summer.

FOR HEATING & COOLING, GAS IS GOOD BUSINESS!

HANDLES "MOON" TEMPERATURE EXTREMES!



New low temperature insulation handles jobs in − 300° F. to + 220° F. range

Of course, this new Unarco U200 insulation is not in use on the moon . . . but it could be, because it handles temperature extremes even greater than would be required on this bleak island in space.* What's more U200 does it without thermal shock effects anywhere along the line.

A new, extremely lightweight, closed cell synthetic, U200 has excellent heat and chemical resistance. Its K factor is only 0.14 at 70° F. mean temperature . . . lowest on the market. Density is only 2.3 lb. per cubic foot. Yet this remarkable, new material has high compressive and flexural strength. It's non-toxic and easy to handle, too.

Try it just once and you'll see how quickly and easily it can be cut and applied with a very minimum of standard hand tools. It can actually reduce application costs by as much as 50%.

Available in accurate, half-round sections; in nominal thicknesses and in standard pipe sizes. Individual sections 36 inches long. Also available in 12" x 36" block form—1" to 5" thickness in ½" increments.

(*) *−243° F. to +214° F. Estimated moon temperatures as listed in a leading American encyclopedia.*

Get complete engineering specifications and other details before another day goes by.

Write today on your company letterhead for Unarco Bulletin No. U200-1.

MILLIONS OF CLOSED CELLS MAKE U-200

- **Waterproof**
- **Vapor Resistant**
- **Efficient**
- **Lightweight**
- **Easy to Handle**

*Closed cell content of 85% plus.

U-200 *The insulation with "Handleability"*

POLYURETHANE FOAM

UNARCO ®

UNARCO PRODUCTS

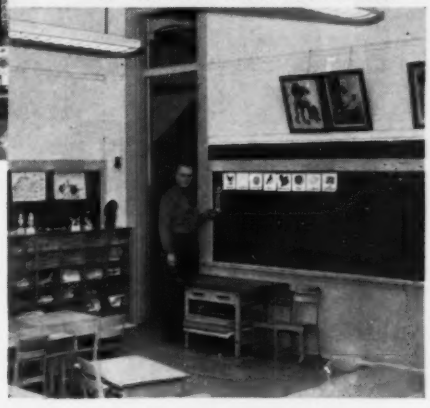
• UNIBESTOS, Amosite Asbestos Pipe Covering and Block • Calcium Silicate Pipe Covering and Block • 85% Magnesia Pipe Covering and Block • Mineral Fiber Block • Wrap-On Insulation • Lace-On Insulation • Turbine Blankets • Insulating and Finishing Cements • Asbestos Textiles • Packing and Gasketing.

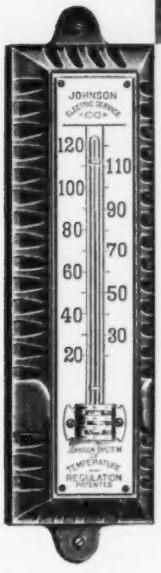
UNION ASBESTOS & RUBBER COMPANY

Fibrous Products Division • **Dept. 246, Bloomington, Illinois.**

George W. Morris School, Louisville, Kentucky. Built in 1852, it still functions efficiently thanks to good maintenance and wise selection of original materials and equipment.

Howard Smith, Heating Shop Supervisor, Louisville Board of Education, inspects a Johnson thermostat installed in 1890.





1890: JOHNSON control system installed

1960: still going strong—70 years later!

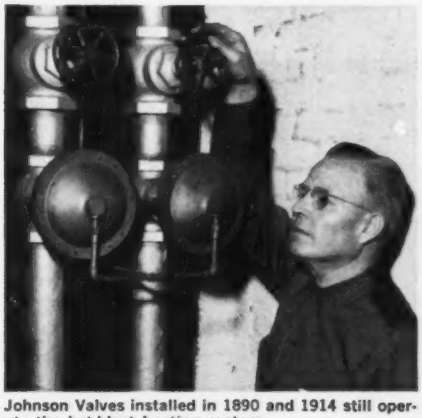
Oldest known automatic temperature control installation provides comfort and economy in 108-year old school

George W. Morris School in Louisville, Kentucky, has what is undoubtedly the oldest automatic temperature control system in the world.

This Johnson Pneumatic Control System was installed in 1890 to control a new blast heating system and provide individual room temperature regulation. More Johnson Thermostats and Valves were installed in 1914 when supplementary direct radiation heating was added. For 70 years, the Johnson System has served this school dependably and economically . . . returning many times its cost in fuel savings while assuring classroom comfort for thousands of students.

Johnson Pneumatic Control Systems have always been designed to provide reliable, trouble-free temperature control for the life of a building. Countless Johnson Systems installed 40 or 50 years or more ago are still giving first-class service.

Isn't this the kind of efficiency and economy *your* clients are seeking? It's a key reason why so many owners count on Johnson for the finest in temperature control at the lowest possible lifetime cost. Give your clients the benefits of Johnson Pneumatic Control, the system you can recommend with complete confidence in its future performance — for the life of the building. Johnson Service Company, Milwaukee 1, Wisconsin. 105 Direct Branch Offices.



Johnson Valves installed in 1890 and 1914 still operate the hot blast heating system.

OUR 75TH YEAR

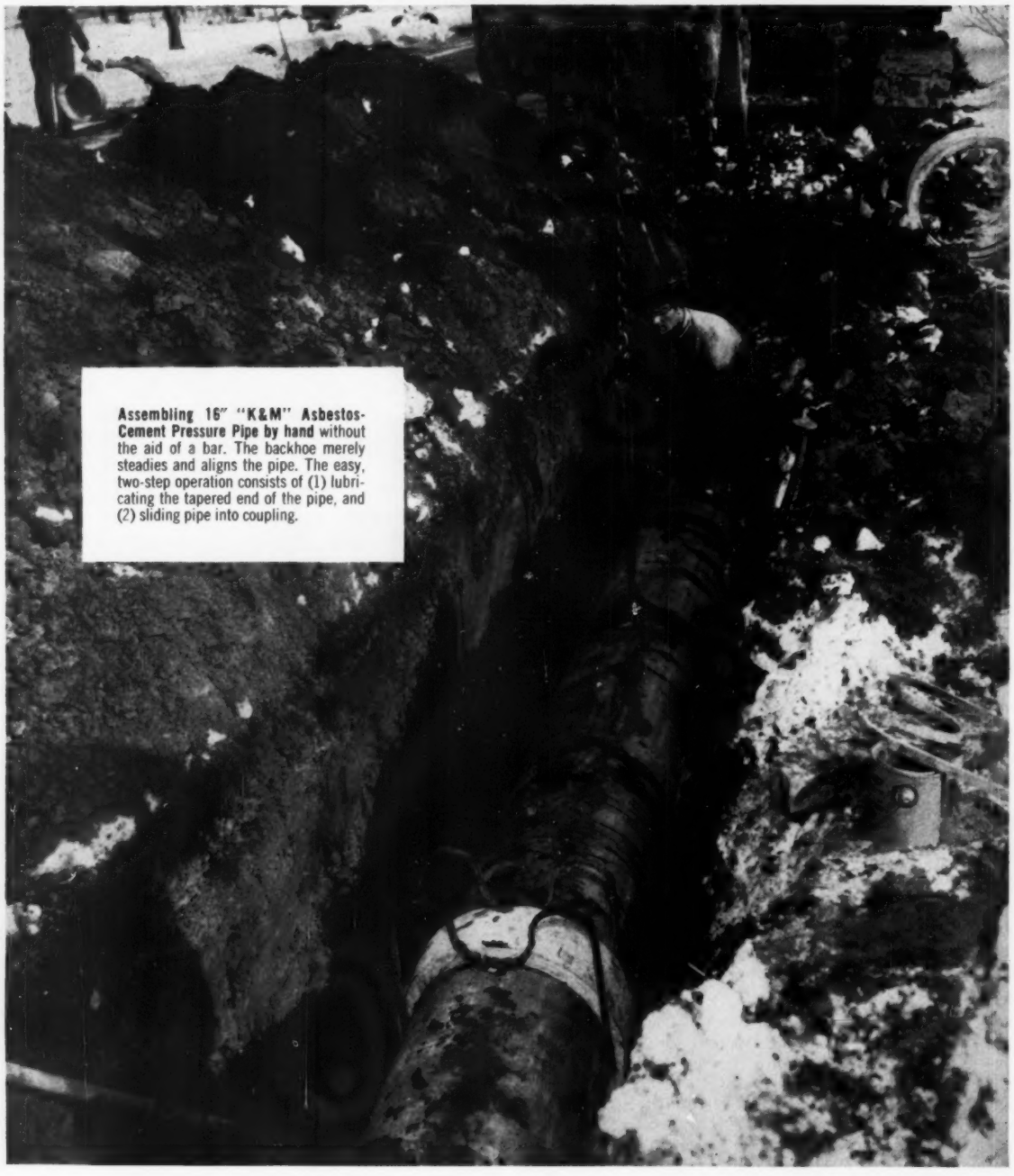
JOHNSON CONTROL

PNEUMATIC SYSTEMS

DESIGN • MANUFACTURE • INSTALLATION • SINCE 1885

"'K&M' ASBESTOS-CEMENT

LAYS AS FAST AS



Assembling 16" "K&M" Asbestos-Cement Pressure Pipe by hand without the aid of a bar. The backhoe merely steadies and aligns the pipe. The easy, two-step operation consists of (1) lubricating the tapered end of the pipe, and (2) sliding pipe into coupling.

PRESSURE PIPE

A SHOVEL DIGS..."

G&B Construction, Inc., Youngstown, Ohio, installs 4½ miles of "K&M" Asbestos-Cement Pressure Pipe for the Austintown District of Mahoning County, Ohio

"You can lay 'K&M' Pipe as fast as a shovel can dig. There is nothing that will hold you back with this pipe. When you can lay a 16" water line, and it goes in as easy as an 8" water line, what more could you ask? They've got a good joint with that FLUID-TITE® Coupling . . . the pipe is wonderful to put together. Of all the 'K&M' Pipe we've laid, we never had a coupling break."

Those are the comments of Louis Gulfo, partner with Mike and James Bertilacci in G&B Construction, Inc. They installed "K&M" Asbestos-Cement Pressure Pipe in bitter cold, during February and March 1960. However, neither rain, snow, nor mud interrupts the installation of this modern pipe. The exclusive, patented "K&M" FLUID-TITE Coupling and the simple fitting procedures required make assembly easy.

Little or no maintenance will face Mahoning County, which built and will operate the system for a year, or the City of Youngstown, Ohio, which will then take it over. Being non-metallic, "K&M" Asbestos-Cement Pressure Pipe won't rot, corrode, or tuberculate, and is immune to electrolysis. The suppliers of this pipe were Trumbull Plumbing Supply Co., Warren and Youngstown, Ohio.

Now, in addition, you may use quality "K&M" Plastic Pressure Pipe in the same system with "K&M" Asbestos-Cement Pipe, if desired.

Write today for more information on "K&M" Asbestos-Cement Pressure Pipe to: Keasbey & Mattison Company, Ambler, Penna. Dept. P-12110.

K·M BEST IN ASBESTOS

Keasbey & Mattison at Ambler

Left to right: Louis Gulfo, G&B Construction, Inc.; Dale MacCleary, sales manager, Trumbull Plumbing Supply Co.; James Bertilacci, G&B Construction, Inc., Burke Lyden, Asst. Chief Engineer, Youngstown, Water Dept., Jim Bisciglia, Asst. Engineer, Mahoning County, and J. Henry Painter, Trumbull Supply Company.

3 miles of 16" "K&M" Asbestos-Cement Pressure Pipe were installed. Here, we see it ready for installation along Webb Road, in Austintown Township. In branching from the 16" water line, Mahoning County used 1 mile of 12" "K&M" Asbestos-Cement Pressure Pipe and ½ mile of 8" "K&M" Asbestos-Cement Pressure Pipe. Specifications call for 90 lbs. pressure when line is in operation serving 16,000 residents.

From the Editor's

Tranquil Tower

What of The Soaring Sixties?

IF THE FIFTIES were good for consulting engineers, the Sixties are likely to be even better. We base this general prediction not on any gift of the second sight or any aptitude for economic forecasting, but on the existence of several positive influences that must work for the prosperity of the consulting engineer. First, there is the constantly increasing cost of both skilled and unskilled labor. In the Sixties the price of labor will go up even more, and the hours worked each year will go down. Clearly, the great users of labor, the manufacturers and the commercial organizations, will be looking for plant and equipment to reduce the labor required to turn out a product and market it. Manufacturers will want automated plants; transportation and warehousing people will be willing to purchase equipment and systems to reduce the number of employees per unit handled; and commercial organizations will want to find ways to replace sales clerks with self-service facilities and supermarket cashiers with automatic checkers. As a result of this search for machinery to replace men, there will be a great upswing in investment in new plant and equipment. This will require the services of consulting engineers.

This search for more applications for automatic machinery and automation will be given additional impetus if the Sixties continue the trend toward free trade. No one has seen any likelihood of a resurging popular movement toward higher protective tariffs in this country. This means that U.S. manufacturers, if they are to stay in business, must make more attractive products at more attractive prices in direct competition with quality imports from low cost labor areas. This can only be done by replacing our high priced labor with low priced power. That, of course, will call for the services of consulting engineers.

Manufacturers will find further encouragement for investment in new plant and machinery if good results come from the pressure currently being put on Congress to revise the tax laws to permit faster write off. There is no doubt that if this were accomplished, there would be an almost immediate rush to replace old with new. This, again, would require the services of consulting engineers.

Public works are in for expansion regardless of political party. This country is ready for better roads, so faster financing methods somehow will be found. Schools, hospitals, water and sewage works, airports, civic centers, and all the other public works of cities, states, and the Federal government are going to be undertaken on a grand scale during the Sixties. And while the expansion of private business depends on the continuance of a reasonable level of business prosperity, the public works sector does not require even that. Whether there is prosperity, recession, or actual depression, the public works expansion will become an explosion in the years immediately ahead.

For the consulting engineers willing to expand geographically and take on foreign projects, the prospects are every bit as bright abroad. The establishment of the Common Market in Europe means that many American firms that want to share in that market will have to build plants within its borders. These new plants will be designed, for the most part, by American consultants.

Political conditions in the Western Hemisphere are such that it is clearly going to be necessary for us to invest some big government money in Central and South America. Much of that money will be loaned through banking institutions that either require or prefer to have the borrower make use of U.S. consulting engineers for the design of the projects being financed.

True, German, British, and even French and Italian consulting engineer firms are competing strongly with U.S. firms where the money has no ties with this country, and while we are certainly getting our share of the engineering work on World Bank financed projects, there are quite a few areas

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of Africa, Asia, and South America where money without strings goes heavily to other than U. S. firms. And there are, of course, the Russians. If engineering is let on a price basis and there are no political factors favoring the West, the Russians can get the work if they want it.

Yet, the demand for engineering service is expanding so rapidly in the less developed nations that there will be work for all but determinedly provincial American consulting engineers.

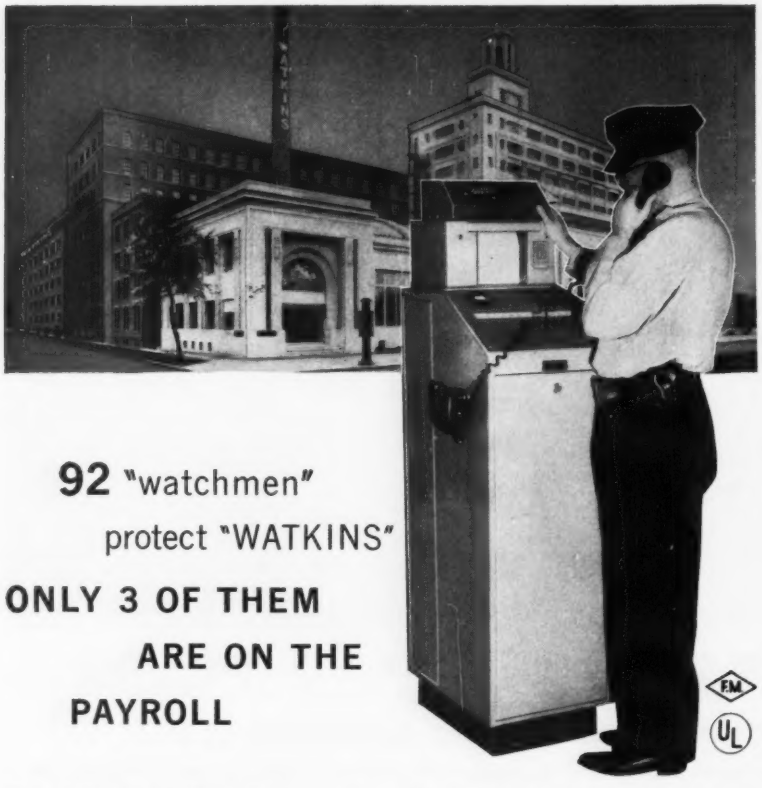
That is the bright side of the Sixties. What of the dark? Are there negative factors that may prevent the consulting engineer from participating fully in the construction prosperity of the Sixties?

Indeed there are! They are not new; they are well known to every consulting engineer. First, there is the growth of government engineering departments — the substitution by government of employee engineers for consulting engineers in all too many agencies of all too many governments — local, state, Federal, and foreign. This is a problem the profession has faced for some time, and it is extremely unlikely that any change of administrations will have any real effect on this wild growth of government engineering. The trend will have to be halted. The change must come through direct action by consulting engineers and their associations, case by case, department by department, project by project, until finally the bureau heads and the legislators are convinced of the advantages of using engineers in private practice.

The other negative factor also is well known to all. That is the offering of engineering services by manufacturers. In the years ahead, this is unlikely to be so unsophisticated as an outright offer of free engineering to the client. Rather it will be replaced by a more subtle method. This takes the form of design and specification work done not for the client, but for the consulting engineer himself. Wherever this succeeds, the consultant is no longer an engineer, he is simply a broker. He soon is eliminated as an unnecessary middleman.

Equally dangerous is the manufacturer who sells his product to the client as the heart of a package deal and then hires a consulting engineer to do the design and to fit the pre-purchased products into it. This practice takes from the engineer all his specification prerogatives and prevents his acting as an independent, unprejudiced agent of the owner. He is no longer engaged by the owner; he is hired by the manufacturer. Where that is done, there is no consulting engineer.

Those are the two great negative factors that could destroy private practice in the Sixties. They will be hard to handle, but to beat them off, to hold them back, is the task before us. If we succeed, the decade will be a bountiful one. ▲▲



92 "watchmen" protect "WATKINS"

ONLY 3 OF THEM ARE ON THE PAYROLL

One of the outstanding advantages of an Autocall Property Protection System is the day-in-day-out savings . . . enough to pay off the initial cost in a short period of time. At the Watkins Products Inc., Winona, Minnesota for example, only one third the normal security patrol personnel is required.

All trouble signals are automatically funneled into the Control Center. Here they are immediately printed (in plain English) on the Autocall-Howe Print Recorder, giving time, location and cause of the signal.

Automatic sensing devices are the "watchmen" of the system that detect and signal dangerous or irregular conditions. Signals are positive, non-interfering and successive. If two or more transmitters are actuated at the same time, each operates in its proper turn.

A money-saving system can be tailored to fit the size and nature of your property. Security personnel can be held to a minimum while protection can be brought to a high level. Get the full story. Phone, write or wire now.

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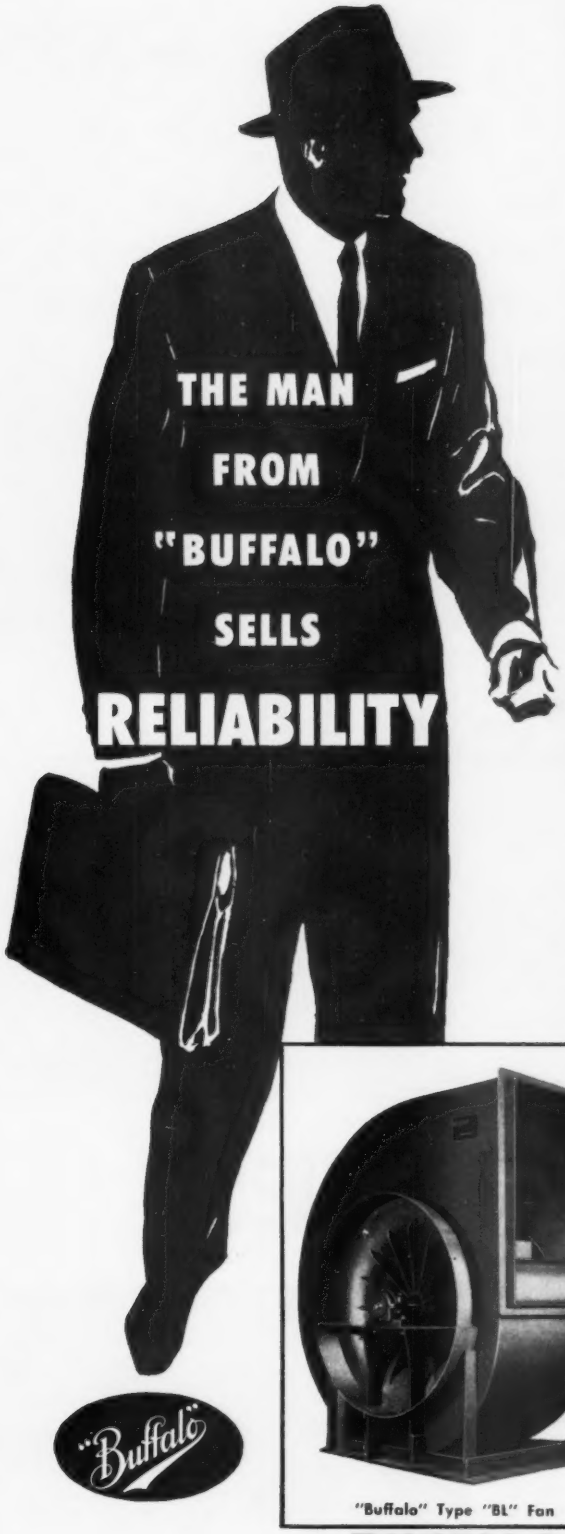


You Can Rely on the Air Handling Products He Sells . . . for effective, efficient and economical service because they are correctly designed and made of quality materials.

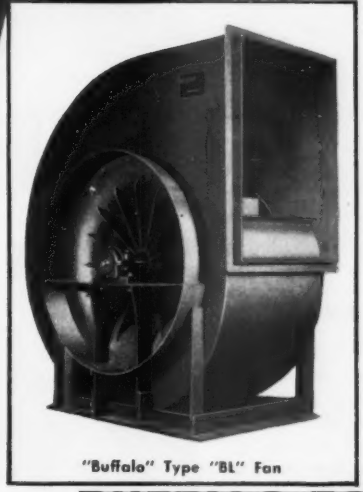
You Can Rely on the Services He Offers . . . because he is a specially trained engineer backed by over 83 years of fan engineering and production experience.

Note the quality features built into the two "Buffalo" Fans on this page. This is the kind of superior construction that insures complete reliability.

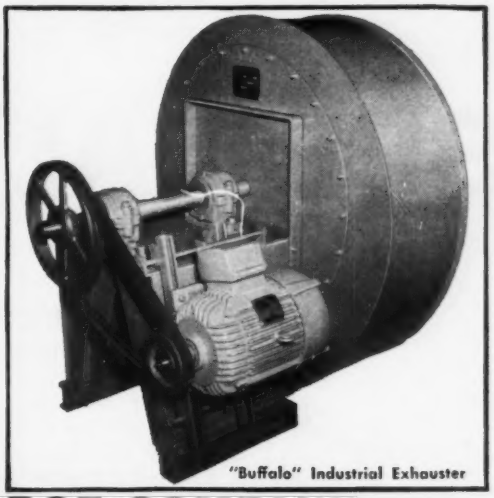
"Buffalo" Industrial Exhausters — the rugged construction of these efficient air and materials handling fans includes heavy steel plate housing, welded throughout. These units are widely used in steel mills, cement plants and similar severe applications. Models are available for moving hot gases from 200°F. to 850°F. In corrosive fume installations, "Buffalo" Rubber-Lined Exhausters outlast metal fans up to twelve to one. These units may be ordered with material wheels for efficiently moving abrasive dust, saw dust, chips, long shavings and a variety of other "problem" materials. For complete facts, write for Bulletin FI-110.

"Buffalo" Type "BL" Fans — These durable fans are designed for peak performance in all Class I and II air moving jobs. Ideal for ventilating, air conditioning and air cleaning systems. The heavy gauge housings are of all-welded construction. Structural steel bracing provides stiffness and rigid bearing support. Hot-rolled or forged shafts are precision made for perfect wheel and bearing fit. Husky backward-curved blades are welded to solid shroud and back-plate. Self-aligning anti-friction bearings assure continuous dependable operation at maximum tip speed. Write for Bulletin F-104.

Whatever your air handling needs, call in "The Man From Buffalo". . . your nearby "Buffalo" Engineering Representative. He'll help you be sure you have the right fan for the job. And when it's a "Buffalo" Fan, you can depend on its reliability.



"Buffalo" Type "BL" Fan



"Buffalo" Industrial Exhauster

BUFFALO FORGE COMPANY

Buffalo, New York

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

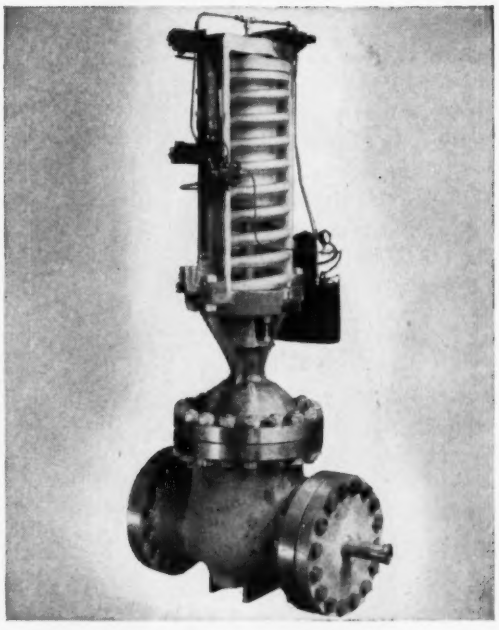
'Buffalo' Air Handling Equipment to move, heat, cool, dehumidify and clean air and other gases.

'Buffalo' Machine Tools to drill, punch, shear, bend, slit, notch and cope for production or plant maintenance.

'Buffalo' Centrifugal Pumps to handle most liquids and slurries under a variety of conditions.

Squier Machinery to process sugar cane, coffee and rice. Special processing machinery for chemicals.

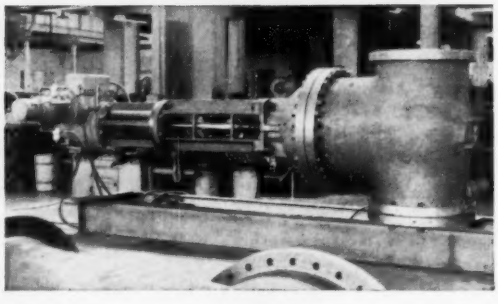
DARLING



AUTOMATIC QUICK-OPENING

Special Stainless Steel Valve developed by Darling to provide fast, automatic opening for dumping a low power nuclear test reactor.

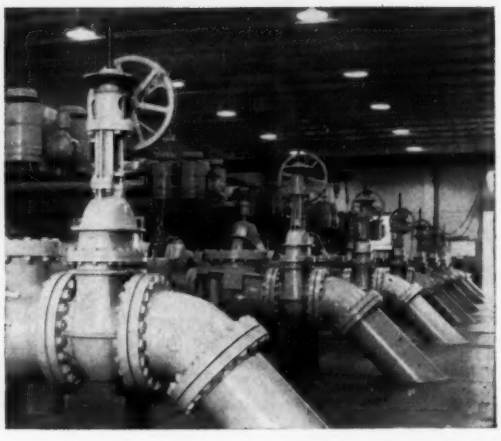
SPECIALIZES IN



HIGH TEMPERATURE

This stainless steel valve, produced for a large overseas petrochemical plant, must operate at 1100 degrees every 15 minutes. Designed for 24-hour-a-day, 7-day-a-week service. Valves produced in 3" to 36" sizes.

SPECIAL VALVES



FAST PRESSURE CHANGES

...from zero to 30,000 gpm in a few seconds, require unusually rugged construction and precision operation due to heavy line surges. These Darling valves are used at Patrick Air Force Base for flooding rocket launching pads.

DARLING VALVES

DARLING VALVE & MANUFACTURING CO.

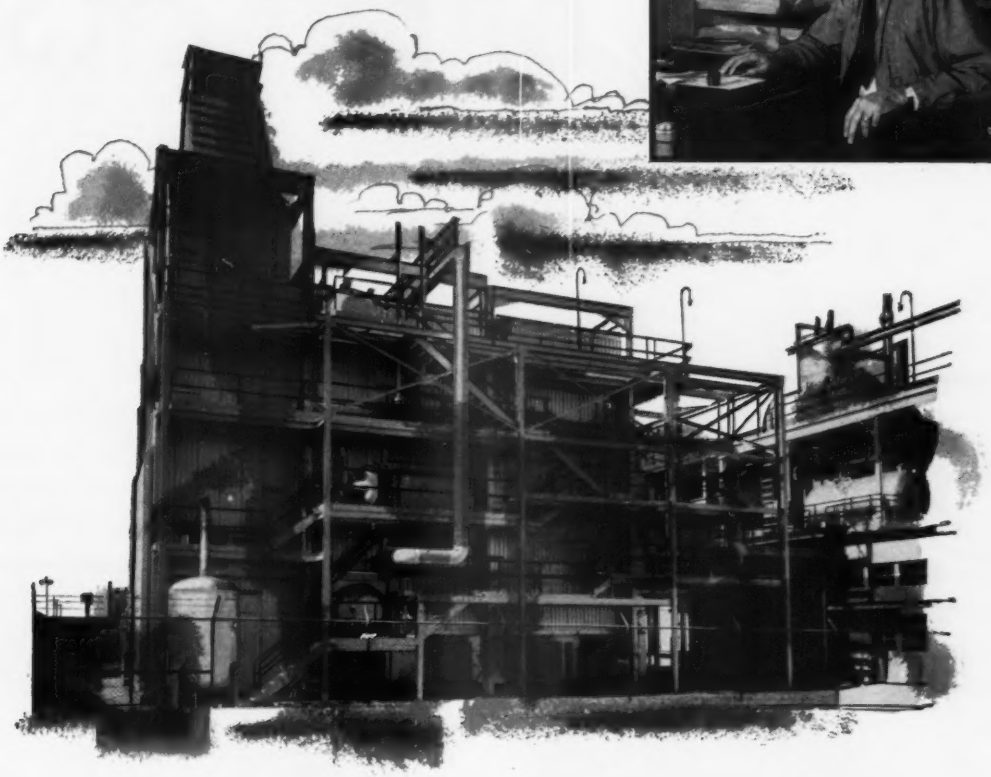
Williamsport 5, Pa.

Manufactured in Canada by
Sandilands Valve Manufacturing Co., Ltd., Galt 19, Ont.

NEW WICKES STEAM GENERATOR

insures maximum efficiency and dependability for BRYAN, TEXAS, MUNICIPAL POWER PLANT

Calvin W. Beard, Superintendent of the Electric Utilities of Bryan, Texas, Municipal System: "As in every other power plant, our steam generator must give completely dependable performance day in and day out".



This Wickes Type RB 2 drum boiler is designed to produce 220,000 lbs. of steam per hour at 875 psig and 900° total steam temperature for the city of Bryan, Texas. The unit performs not only with remarkable dependability, but with Wickes' usual efficiency and economy. Wickes Boiler Co. builds steam generators in sizes to 500,000 lbs. of steam per hour, for high or low steam pressures and temperatures and for all types of fuels and firing methods. See your nearest Wickes representative for full information on a Wickes steam generator designed to suit your needs.

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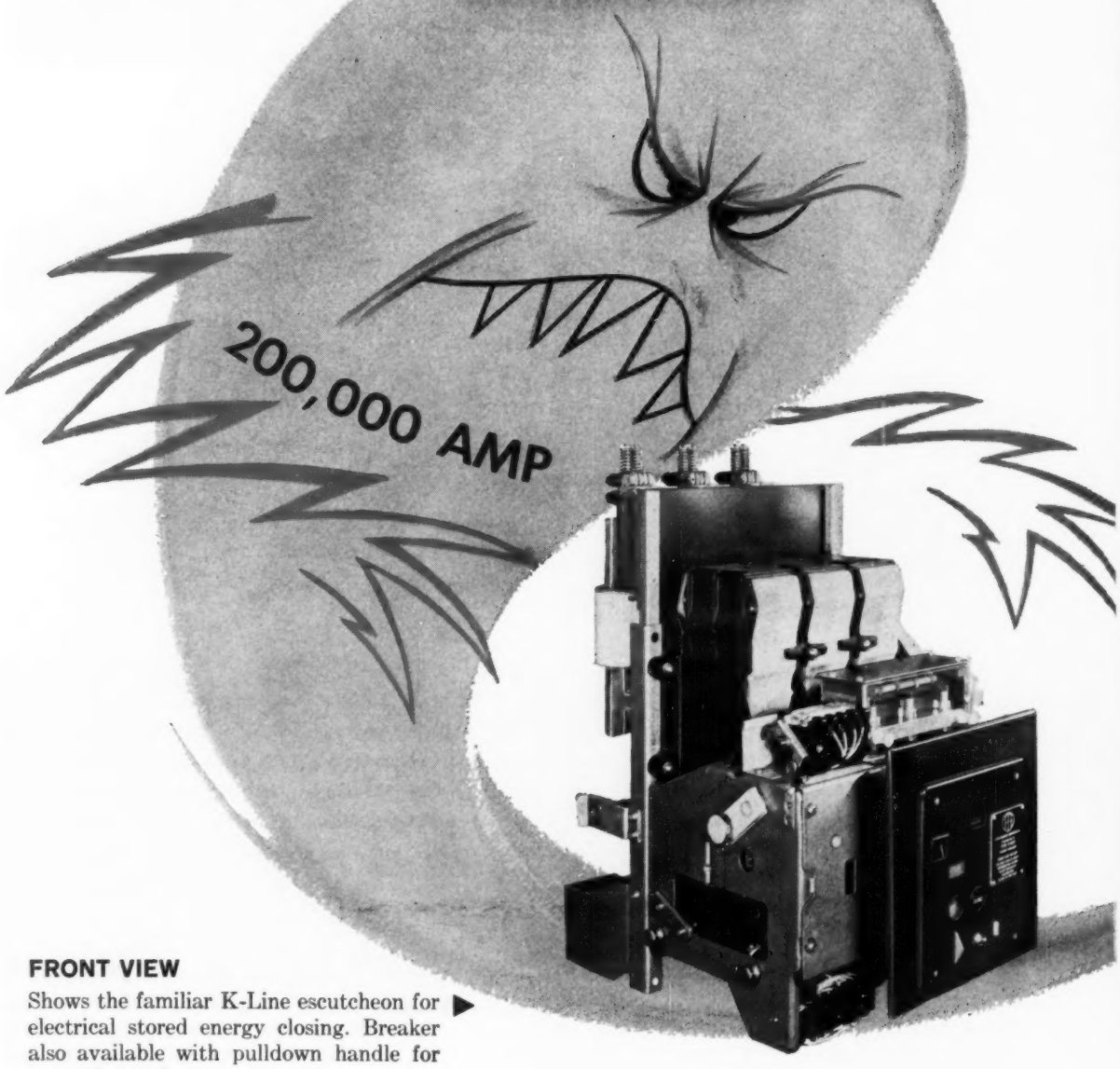
Bulletin 55-1 gives details of a wide variety of designs and sizes of Wickes field-erected and shop-assembled steam generators. Write for your free copy.

174

WICKES BOILER CO., SAGINAW 16, MICHIGAN, DIVISION OF THE WICKES CORPORATION

HOW MANY AMPERES LURK BEHIND YOUR LOW VOLTAGE CIRCUIT BREAKERS?



FRONT VIEW

Shows the familiar K-Line escutcheon for electrical stored energy closing. Breaker also available with pulldown handle for manual stored energy operation. ▶

I-T-E's new K-Don protects against fault currents up to 200,000 amp—plus giving you the complete range of K-Line circuit breaker operation

Suppose you have a low current fault. The K-Don circuit breaker element gives you time delay tripping. Or a medium current fault. You get instantaneous tripping. And for really high-capacity faults, you have the current-limiting action of Amp-trap® fuses in series with the breaker.

MAXIMUM FUSE ECONOMY

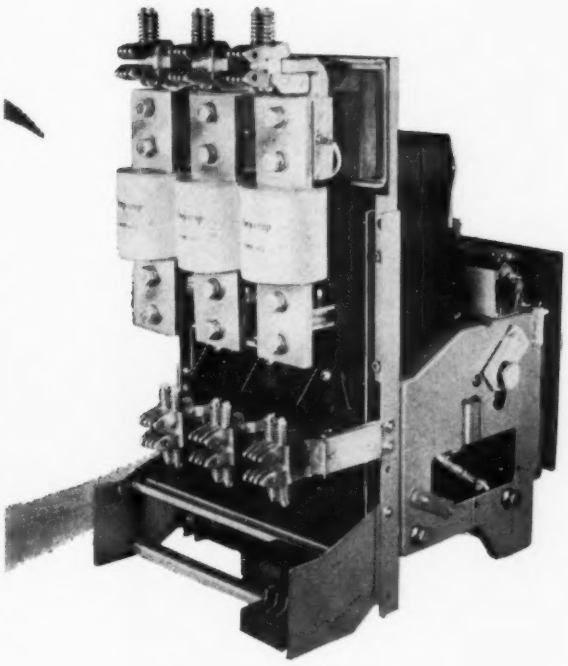
Only the I-T-E K-Don gives such complete protection—circuit breaker protection over the standard circuit breaker range and economical fuse protection from there on up to 200,000 amp. The only time fuses blow is when fault current is too high for the circuit breaker to handle. The K-Don is not a fuse hog.

NO SINGLE PHASING

The K-Don gives you this double protection all in a single compartment—saving you cost and bulk. And regardless of the type of fault, all three phases open every time. No single phasing to cause costly equipment damage.

COMPLETE RANGE OF RATINGS

Basically, the K-Don is a standard 600 volt K-Line circuit breaker with current-limiting fuses in series. Besides high current protection, you also get the advantages of expanded range trip and closed door drawout. Breaker ratings range from 30 to 1600 amp continuous, up to 75,000 amp interrupting. Versatility of protection is assured by a range of fuse ratings from 400 to 3000 amp. Drawout mountings are available in either Urelite® enclosures or switchgear assemblies. Write for detailed bulletin 4300-1A. I-T-E Circuit Breaker Company, 1900 Hamilton St., Philadelphia 30, Pa.



BACK VIEW

◀ Shows Amp-trap current-limiting fuses in series with circuit breaker. Fuses are on line side so they protect the breaker as well as connected equipment.

I-T-E CIRCUIT BREAKER COMPANY

WANT TO TURN MAINTENANCE DOLLARS INTO PROFIT DOLLARS FOR YOUR CLIENTS?

Tom Robertshaw can show you how. Tom's a paint expert—one of a growing force of specialists in Du Pont's Technical Service Group. His mission: to help you pare down the high cost of maintenance painting for your clients. As he sees it:

"Every maintenance dollar saved is a profit dollar. To insure your customers maximum return on their investment, begin with quality paint. Too many maintenance men have learned the costly lesson that price-per-gallon as a measure of economy can be misleading. When your clients specify Du Pont, they're getting the best paint available, backed up by proven performance in the field.

"However, that's only half the story. To bring down the cost of protecting equipment—and keep it down—the right paint *system* is vitally important. Here's where Du Pont technical competence really pays off. We see to it that the system your clients employ is specifically suited to their needs. Our recommendations, based on a thorough study of the problem, cover everything from surface preparation and paint selection to the most efficient methods of application. We'll also suggest ways to use color effectively to improve plant appearance and promote safety. It adds up to this: lasting protection and longer service life *at lowest cost per square foot per year.*"

There are men like Tom Robertshaw working out of Du Pont district sales offices from coast to coast. Why not let one of them put his training and experience to work for *you?* Call the office nearest you, or write: E. I. du Pont de Nemours & Co. (Inc.), Finishes Division, Dept. CE-611, Wilmington 98, Delaware.

* * *

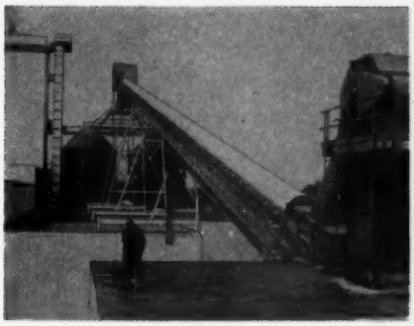
Thomas J. Robertshaw began his career with Du Pont in 1938. Following wartime Navy service as an Aircraft Finishes Specialist, he returned as Assistant to the Sales Technical Advisor in Philadelphia. In 1952 he was made responsible for Maintenance Sales in New England and upstate New York. Since 1957, he has been Central District Manager, Industrial Maintenance Sales. Among the industries for which he has solved maintenance painting problems: marine, automotive, chemical, steel, petroleum and food.

DU PONT PAINTS

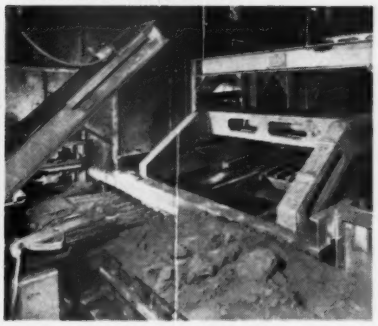
BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

TRUCK ASSEMBLY SYSTEM

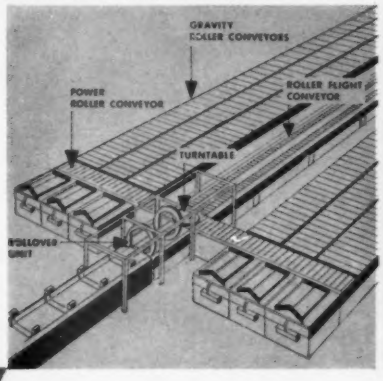
LOG AND CHIP HANDLING SYSTEM



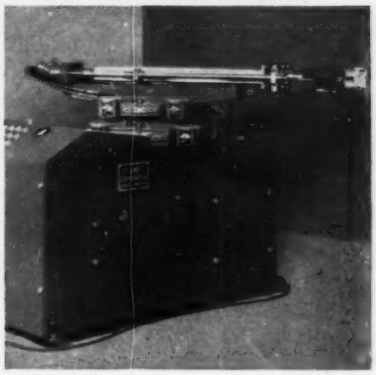
AUTOMATIC SHAKEOUT SYSTEM



ENGINE BLOCK HANDLING SYSTEM



PLANOBOT UNIVERSAL TRANSFER DEVICE



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If you have a production, materials handling, or automation problem, "PV" will save time and money, and increase efficiency and production. "PV" stands for *Planet Versatility* . . . a quality that has made Planet Corporation known throughout industry as an organization that has the solutions to the most perplexing problems.

Planet Corporation is an organization of experienced, creative engineers who, by applying uninhibited thinking to your problems, save your time in finding workable solutions that increase your efficiency. No job is too big or too difficult — they have designed complete foundrys, automated production lines, built bulk and unit materials handling systems, developed the world's only true universal transfer device . . . all types of special handling and automation machinery, and materials handling equipment.

No matter what you make, "PV" means that it will pay you to have Planet Corporation on your team. Write or phone today to have a Planet "PV" engineer discuss your problem. Or send for Planet's free 88-page catalog . . . there's no obligation, of course.

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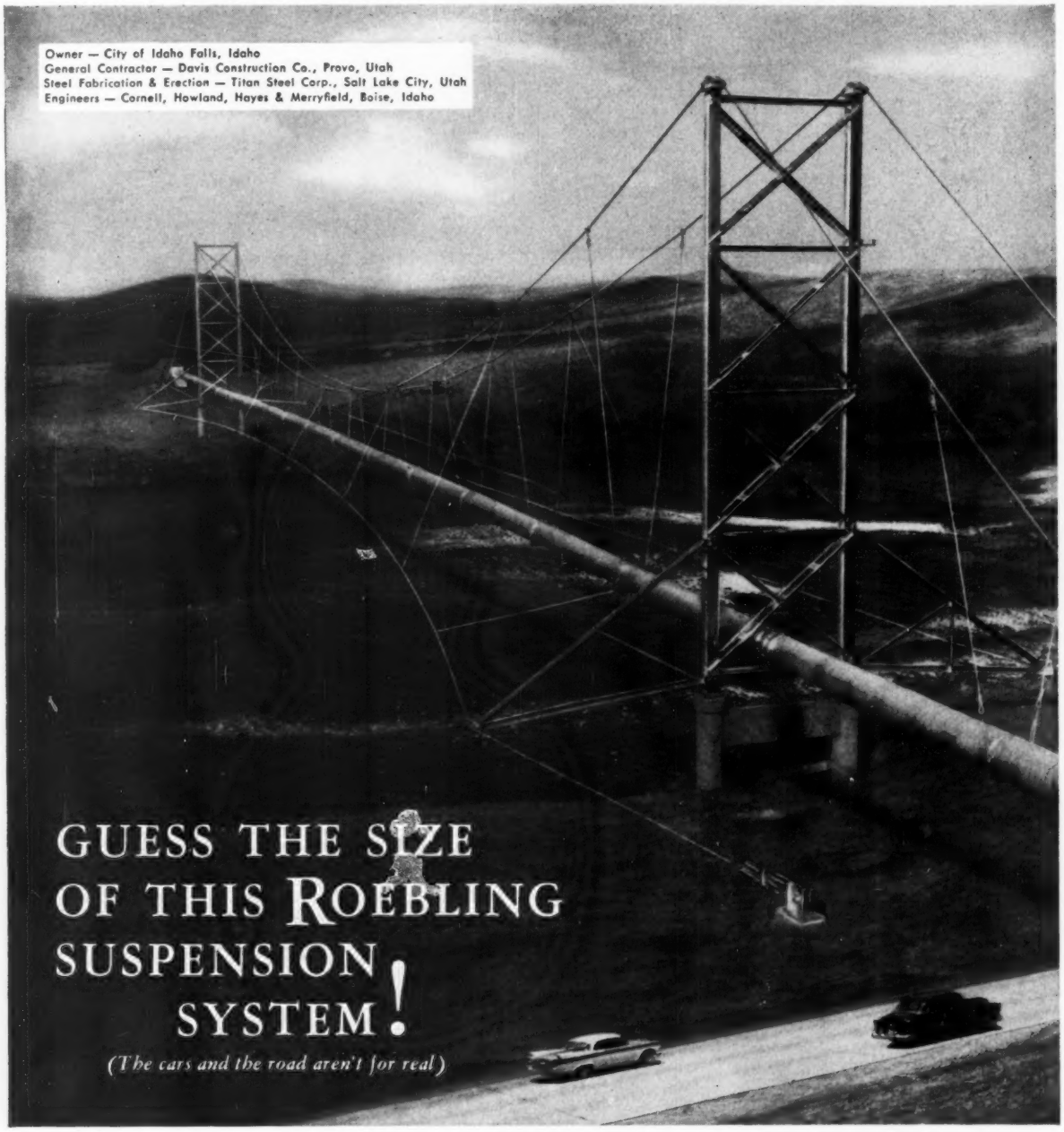
Owner — City of Idaho Falls, Idaho
General Contractor — Davis Construction Co., Provo, Utah
Steel Fabrication & Erection — Titan Steel Corp., Salt Lake City, Utah
Engineers — Cornell, Howland, Hayes & Merryfield, Boise, Idaho
GUESS THE SIZE OF THIS ROEBLING SUSPENSION SYSTEM!
(The cars and the road aren't for real)

It looks huge, doesn't it?

It isn't. It is an 18-inch gravity pipeline across Idaho's Snake River. Its overall length is 360 feet, 240 feet between towers.

We think this is proof that when it comes to suspension systems, size is no object. We are in a position to furnish specialized technical services, materials, and, when necessary, construction services, for any part of a suspension-system project, from conception to the last coat of paint. This includes bridges for pipelines, for conveyors, for pedestrians or for vehicles.

Don't think for a moment that your needs are too modest. We invite inquiries on suspension systems of any kind (18-inch pipelines or 18-lane vehicular bridges). Just ask Roebling's Bridge Division, Trenton 2, New Jersey.

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John A. Roebling's Sons Division, The Colorado Fuel and Iron Corporation

Readers' Comment

Likes Sewage Report . . .

We want to compliment you on your Special Staff Report titled "Sewage Treatment" in your September issue.

Your magazine is excellent and contains many articles of interest for consulting engineers.

Please furnish us with a reprint of the Sewage Treatment article.

Fred H. Wilson
Flood, Wilson and Associates
Jacksonville, Florida

But Errors There Are

Your article about sewage treatment in the September 1960 issue has been called to my attention. It is attractively illustrated and generally well done. However, the third paragraph in the article has some erroneous statements and gives the impression — doubtless unintended — that the Kansas State Board of Health and some unmentioned group are in collusion to force several major industries in Kansas City, Kansas to pay the city for treating sewage.

The facts are these: (1) L. R. Howson made a preliminary study for several meat packers and the Kansas City Stockyards Association to determine if they could treat their wastes more economically than they could pay the city to do so. Mr. Howson concluded that they could. (2) A part of the proposed treatment facilities offered by Mr. Howson was for the storage of raw sludge in an open 20-acre lagoon. (3) The Kansas State Board of Health told Mr. Howson and the industries that treatment in individual plants or discharge to the Kansas City sewers for treatment by the city would be satisfactory, but it refused to approve the digestion of raw sludge in open lagoons in the location proposed. The location is 1000 feet from residences and considerably closer than this to some commercial areas and two major roads which are heavily traveled.

While the industries would doubtless have preferred the open lagooning of raw sludge, which they viewed as their cheapest method of sludge handling, they are now investigating other methods of digestion and disposal. Their studies are including the possibility of obtaining a site for the lagooning of sludge which is not located in the heart of a residential-commercial area.

Dwight F. Metzler, Director
Division of Sanitation
The Kansas State Board of Health
Topeka, Kansas

For the Functional Plan

In the biography of Enoch R. Needles the subject of engineering unity was discussed. He questioned the feasibility of the Functional Plan. He also questioned the solution of problems of national scope affecting only one branch of engineering.

It is difficult to conceive of any national problem in the nontechnical areas of the engineering profession that could not have at least an indirect effect upon other branches of engineering, and if there was, a satisfactory solution could be found within the principles of the Functional Plan.

Needles talks about unity. He appraises the need for it and is cognizant of its desirability. The only solution he offers is through the technical societies and EJC. This has been tried for years with less than desirable results.

The mere fact that the National Society of Professional Engineers has grown to 55,000 members since it was established in 1934 clearly indicates a repudiation of any existing federation as far as unity is concerned.

How does Needles account for the fact that AIEE is credited for proposing the Functional Plan with overwhelming support from ASME and NSPE? These three groups represent the three largest engineering societies.

The recent poll by NSPE indicates a decided preference for the principles of the Functional Plan. The most significant factor in the organization of NSPE is its three levels of autonomy; the local chapter, the state society, and the National Society. In most areas of the country EJC is not represented at either the local or the state levels as an aggressive organization. An effective program of unity must reach the individual members at the local level.

Unfortunately, it is through the technical groups that we sometimes tend to lose our unity. We might assume that this is a by-product of our specialization. I suppose this is an outgrowth of many splinter groups that have organized for engineering specialties.

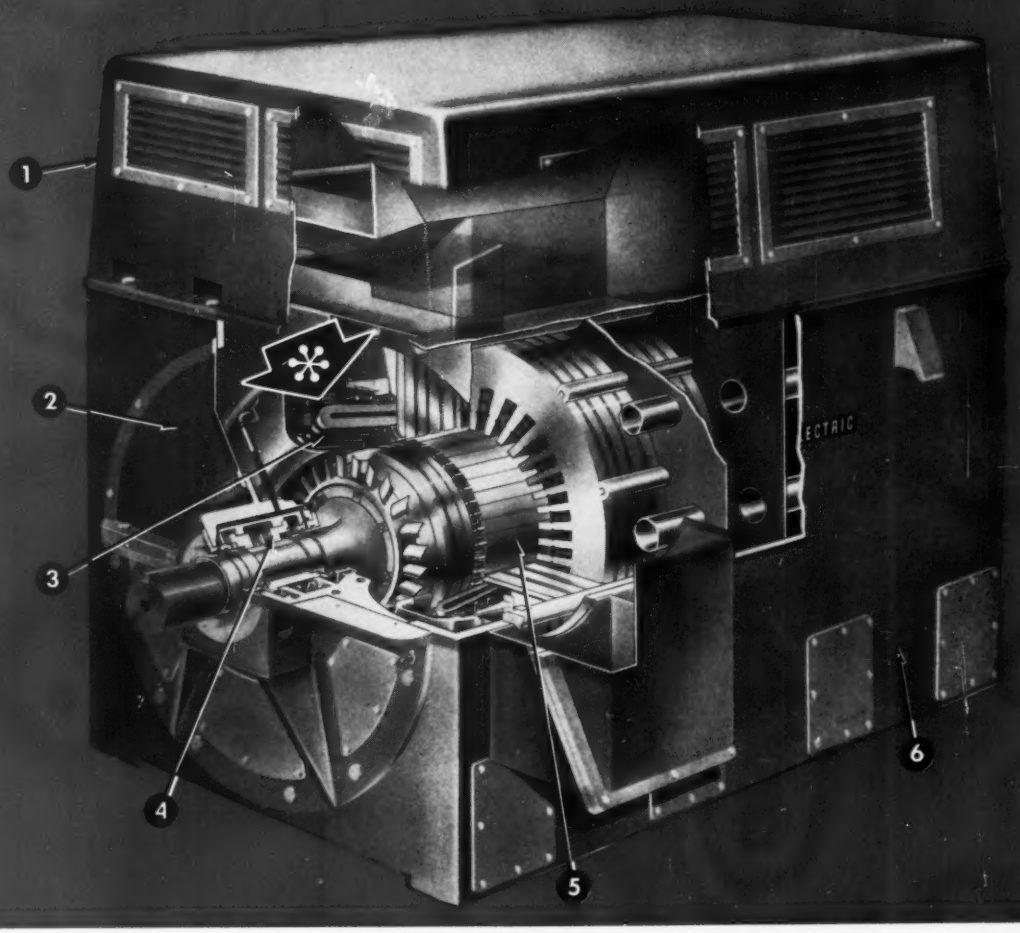
Robert E. Hutton
President, Indiana Society of
Professional Engineers

More on Definitions

The definitions of a consulting engineer in January and February

NEW General Electric CUSTOM '8000' Boiler Feed Pump Motors . . .

CUSTOM DESIGNED FOR POWER STATION APPLICATIONS



1 **REMOVABLE "TOP-HAT"** provides easy access to motor interior. Top-hat is baffled and lined with sound absorbing materials to attenuate motor operating noise. Rotor and stator are constructed to reduce noise and direct sound waves into the acoustically treated top hat.

2 **NEW END SHIELD DESIGN** reduces time required for inspection and maintenance. One man can quickly unbolt and lift off the upper end shield half and remove the split air deflector. Bearing support is integrally cast with the lower end shield. Lower half of bearing can be "rolled out" for inspection without removing end shield.

3 **EXCLUSIVE POLYSEAL* SUPPORTED SILICONE RUBBER INSULATION SYSTEM** provides superior mechanical, thermal, voltage and environmental endurance—affords top reliability in critical Electric Utility applications.

4 **TRIPLE PROTECTED BEARING SYSTEM** lengthens boiler feed pump motor life. A primary seal is formed by the ring mounted on each end of the bearing shell and adjacent oil slinger machined in the shaft. A multiple groove seal at each end of bearing housing acts as a second line of defense against dirt entrance and oil leakage. In addition to the slingers and close running labyrinth seals, G.E.'s new bearing system utilizes an *Air-Lock* seal in each bearing housing. Air at slightly higher than atmospheric pressure is piped to annular grooves at each end of the bearing. This air pressure acts as a third seal to keep oil locked in the bearing housing.

5 **ROTOR PARTS ARE MACHINED TO PRECISION TOLERANCES** and assembled using especially developed techniques to assure high-speed operational stability.

6 **RUGGED FRAME ASSURES SOLID STRUCTURAL SUPPORT** for stator, end shields, rotor and top-hat. Frame is precision machined to positively align motor parts.

GENERAL ELECTRIC'S "CUSTOMIZED" MOTOR manufacturing philosophy permits the design flexibility, and the adherence to quality control production standards, which assure Electric Utilities of optimum motor performance, reduced operating costs and lower first cost. In keeping with requirements of Electric Utilities, Custom '8000' boiler feed pump motors are available now in ratings to 10,000-hp. 883-01

* Trade-mark of General Electric Co.

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encapsulated connection harness increases mechanical strength, assures maximum motor reliability

General Electric's new encapsulated connection harness consists of two rings of insulated conductors encapsulated in epoxy resins. The larger ring contains motor leads and phase connections, while the smaller ring contains equalizer connections.

This new system provides greater strength and rigidity at the end turns and assures uniform coil connections. Rigid encapsulation prevents contact between conductors—eliminates insulation abrasion. The epoxy compound provides additional insulation for leads and connections.

NEW ENCAPSULATED CONNECTION HARNESS for General Electric boiler feed pump motors provides an immobilized connection bundle . . . eliminates loose ties and abraided insulation.

YOUR GENERAL ELECTRIC APPARATUS SALES REPRESENTATIVE has full details on new G-E boiler feed pump motors. Call him today. Medium AC Motor & Generator Department, Schenectady 5, N.Y.

Progress Is Our Most Important Product

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1960 were most useful, but may be trimmed and more added:

A *consulting engineer* is a professional engineer who holds himself out to the public for hire as able to practice engineering. (This is equivalent to "engaged in the private practice of engineering.")

Further:

Engineering is the science of the analysis, design, construction, and operation of machines, processes, structures, utilities, and public works, requiring the employment of mathematics and the physical sciences in its application.

And:

A *professional engineer* is a person who has met the minimum standards established by the engineering registration statutes of the states wherein he is practicing. In many states, these standards include graduation from an engineering college accredited by ECPD, adequate experience, and demonstrated technical capacity.

Leonard M. Todd
Consulting Engineer
New York, New York

The Hoover Commission

I have read with considerable interest the staff article in the August 1960 issue of CONSULTING ENGINEER entitled "What Did Hoover Really Report?"

The article cites the First Hoover Commission's Task Force Report on Public Works and the Second Commission's Task Force Report on Real Property Management.

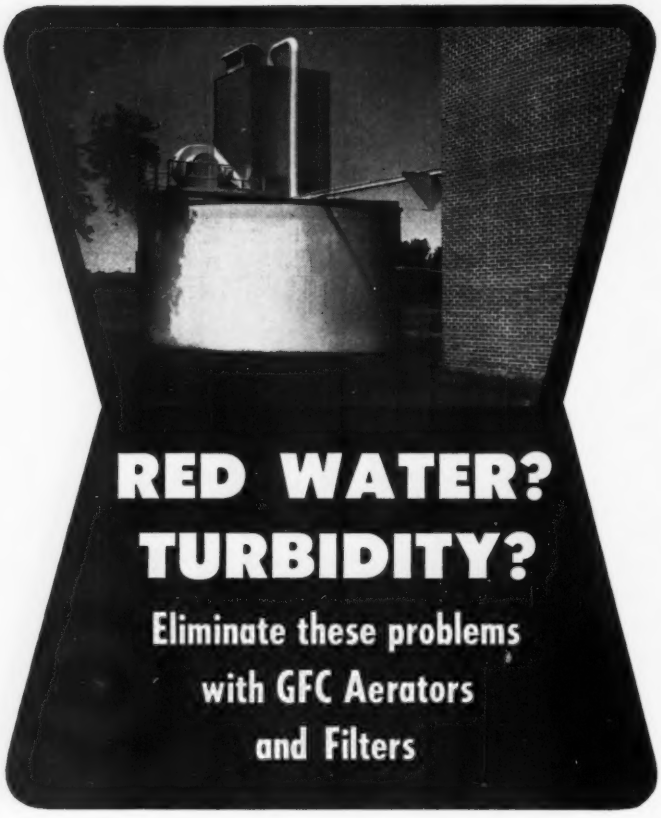
In addition to Robert Moses' Task Force Report on Public Works, the first Hoover Commission had before it Governor Miller's Task Force Report on Natural Resources and Colonel Roberts' Appendix K, a Task Force Report on Water Resource Projects — both concerned with elements of the Federal Public Works programs and activities.

The second Hoover Commission made a report on Water Resources and Power and had from its Task Force on Water Resources and Power a report in three volumes covering some 1800 pages. The instructions given to that Task Force and the Task Force on Real Property Management were that the assignments to each were mutually exclusive.

I believe that the Federal water resources and power activities are generally recognized to come within the category of public works.

There is a special analysis of Federal activities in public works and other construction in the budget document as sent to Congress. This special analysis in the 1961 budget shows that in 1959 there was expended $4,534 million for Federal civil public works. Of this, over $2,588 million was from a trust fund for Federal-aid highway grants, leaving less than $2 billion for other programs. Roughly $965 million was spent by the St. Lawrence Seaway Development Corporation, TVA, the power and irrigation agencies of the Department of the Interior, the International Boundary and Water Commission of the Department of State, and the Army Corps of Engineers, all for projects concerned with water resources and power. This is roughly 20 percent of the total expenditure and approximately 50 percent of the actual construction work of the Federal government listed in the budget as "total, all functions, Civil Public Works, Budget Accounts," amounting to $1,930,611,000. From those figures I think it fair to conclude that the water resources and power activities of the Federal government are significant in the Federal Public Works Program.

Good as is the article in the August 1960 issue, I think the omission is a serious one. Even though these reports on Water Resources and Power may have had little to say about engineering cost, and while it is most important to note, as you do, the difference between the Commission reports and Task Force reports, there is an implication that your article has brought together



Iron and corrosive, odorous gases cause red water, leaky pipes and clogged meters. Unless corrected, these problems will result in loss of revenue, and consumer complaints.

GFC Forced Draft Aerators and Filters can solve these problems. They are designed for easy assembly, dependability and long life.

Ask about our new aluminum and fiberglas Aerators. Write for your copy of our new Aerator and Filter Plant bulletins with design data and problem analyses.

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WATER PROCESS EQUIPMENT AMES IOWA

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everything the two Commissions and their Task Force had to say about Federal Public Works programs. The engineering profession should not overlook the Water Resources and Power study and the earlier Natural Resources, Revolving Funds, and Water Projects studies in reviewing what the Commissions had to say about public works.

Charles D. Curran
Executive Director
U. S. Study Commission – Texas
Houston, Texas

Wants Woodcuts

I have read in the current issue of CONSULTING ENGINEER that you have printed some of Philip Reed's woodcuts and are making them available to readers of your magazine. I have always admired Mr. Reed's woodcuts, and I shall very much appreciate it if you could send me a copy of any of them which you have printed in a form suitable for framing.

I would like to take this opportunity to make a suggestion: CONSULTING ENGINEER has very fine articles dealing with the professional problems and also of technical nature. Many of the articles deal with some phases of the history of engineering in ancient times. I would like to suggest that such articles, of permanent nature, be printed without intervening advertising material, and in a way that they could be removed from the body of the magazine for assembly in a bound book. Alternately these could be reprinted and made available for distribution to engineers who ask for them.

Saby Eliachar
Consulting Engineer
Daly City, California

Our readers are reminded that, while the supply lasts, tear sheets of any article will be mailed on request at no charge. Just address Reader Service Department, CONSULTING ENGINEER, *217 Wayne St., St. Joseph, Michigan.* ▲▲

NIGHT-DAY

6 AMERICANS WORK AROUND THE CLOCK ON NORTH AMERICA'S BIGGEST POWER PROJECT

WORK NEVER STOPS on the gigantic $720,000,000 Niagara Power Project—largest hydro-electric development in the Western Hemisphere. Consulting engineers are Uhl, Hall & Rich of Boston.

Five big American Revolvers work at three levels on Merritt-Chapman & Scott's $98,800,000 contract for the main Niagara Generating Plant. By day they handle material, set forms—at night, pour concrete. 1,200,000 cubic yards of concrete and 42,000 tons of steel go into this structure alone!

American's work-horse dependability is essential on projects like this where equipment failure or poor performance can slow down work, foul up schedules. Consulting engineers and contractors know that top-rated, tough American Cranes keep jobs on schedule.

Write for detailed, illustrated information on the complete line of American equipment specially engineered for a wide range of construction and materials handling duties.

AMERICAN HOIST
and Derrick Company
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EXCAVATORS-CRANES to 4½ yds.-110 tons
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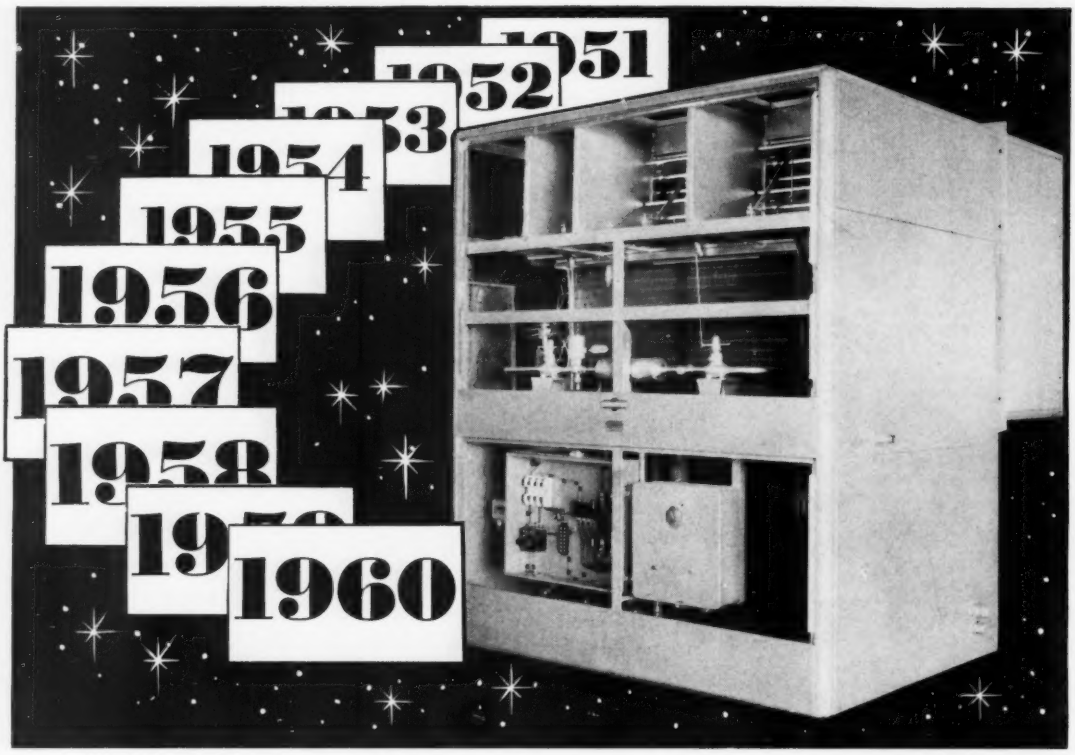
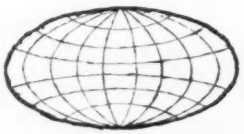
REVOLVER CRANES to 400 tons
CROSBY-LAUGHLIN DIVISION
Forged fittings for wire rope-chain



a decade of **proven** performance in self-contained multi-zone units



Yes, for ten years, GOVERNAIR has led the way in the engineering and development of self-contained multi-zone air conditioning units.

Both the Evaporative Condenser Package (type SCMZ) and the Water Cooled Condenser Package (type STMZ) are far beyond the pioneering stage, and have been tested and proven in actual use throughout the world, under widely-varied conditions.

Available in 8 through 100 tons, every unit is "Satisfabricated" to fit individual job zone and capacity requirements . . . assembled from the finest materials and components, then thoroughly factory-tested before delivery. For complete information, please write . .

GOVERNAIR

4840 NORTH SEWELL • OKLAHOMA CITY, OKLA.

SILICONE NEWS from Dow Corning

Now I'm In Little League

Since We've Converted "Down-time" to "Spare-time" by Specifying Silicones

Three years ago, when Little League baseball was organized in our community, I was interested. Because I'm a family man with three boys, and I'd been a fair ball player, I was asked to manage a team. I wanted to help, but with my job, I knew I wouldn't have the time.

You see, I'm maintenance manager at the local foundry and metal working plant. We have more than 1500 integral horsepower motors. When a motor burns out, it has to be replaced immediately. With the increased frequency of failure in the summer ... plant temperatures skyrocket ... my time is not my own.

One day I saw a Dow Corning advertisement about silicone insulated motors. I wrote them and got all the information ... technical data, too. After studying the material, I suggested to management we run our own life tests by having our problem motors rewound with silicones instead of with Class B insulation, as we were doing.

Result: we now specify silicone insulation in all of our motors exposed to heavy duty cycles, shock loads, frequent start-stop-reverse operation, high ambient temperatures and humidity. Savings are around $5000 a year ... *not counting the savings in production and maintenance time.*

The sharp reduction in motor maintenance has given me some free time. This summer I managed a Little League team. By the way, my oldest boy looks great at second base, and he's no slouch at the plate.

Say, why don't you write Dow Corning for their literature on silicone insulated motors and transformers? I'm glad I did.

(This fictional story is based on actual plant experience with silicone insulation. Name provided on request.)

For information on silicone insulated motors, write Dept. 2311

first in silicones

Dow Corning CORPORATION
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ROOF DECK

ALL THE FEATURES YOU WANT . . . IN ONE PRODUCT

Let's be honest. Today, *all* brands of steel roof deck do a useful, high-quality job! *All* brands offer important benefits.

Isn't *your job*, then, to find the one product offering the most features?

This may help: Here's a list of Granco Steel Roof Deck features. Won't you check it over? . . . compare it with others? You'll see why so many architects and contractors specify Granco Roof Deck.

TOUGH FINISH—Flint-hard enamel, "flow coated" over cleaned, phosphate-coated steel deck, is baked on at 350° F. for 20 min. Rust-preventive finish resists scratches, prevents corrosion.

LONG SHEETS—up to 21′ 6″—permit long continuous spans, stronger construction.

STRONG—New sheet design provides greater strength and load-carrying capacity.

FAST PLACING—Sheets cover up to 43 sq. ft. Wide sheets mean fewer laps and welds.

YEAR-ROUND CONSTRUCTION—Place Granco Roof Deck in any weather that permits outdoor work.

SIMPLIFIED SYSTEM—Place and weld sheets to framing. Apply insulation. Add built-up roof. Fast!

EASY TO WELD—Wide rib openings speed plug welding from top side.

FIRE-RESISTANT SYSTEM—often means lower insurance rates.

FLARED END—means simplified nesting.

20-YEAR ROOF BONDS—obtainable on Granco Roof Deck with 1″ insulation board.

ATTRACTIVE—Underside of Granco Roof Deck creates striking "paneled" ceiling.

VERSATILE—Granco Roof Deck is ideal for panels, canopies, side walls, etc.

CHOICE OF GAGES—18, 20 and 22 gage meet wide range of span-load conditions.

ECONOMICAL—Structures designed for Granco Roof Deck often save 5¢ to 10¢ per sq. ft. in framing cost over heavier-type decks.

SEND FOR FREE ROOF DECK PRODUCT MANUAL

GRANCO STEEL PRODUCTS CO., 6506 North Broadway, St. Louis 15, Missouri
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Just sign coupon . . . clip to your company letterhead . . . mail today. Address Department CE-6011.

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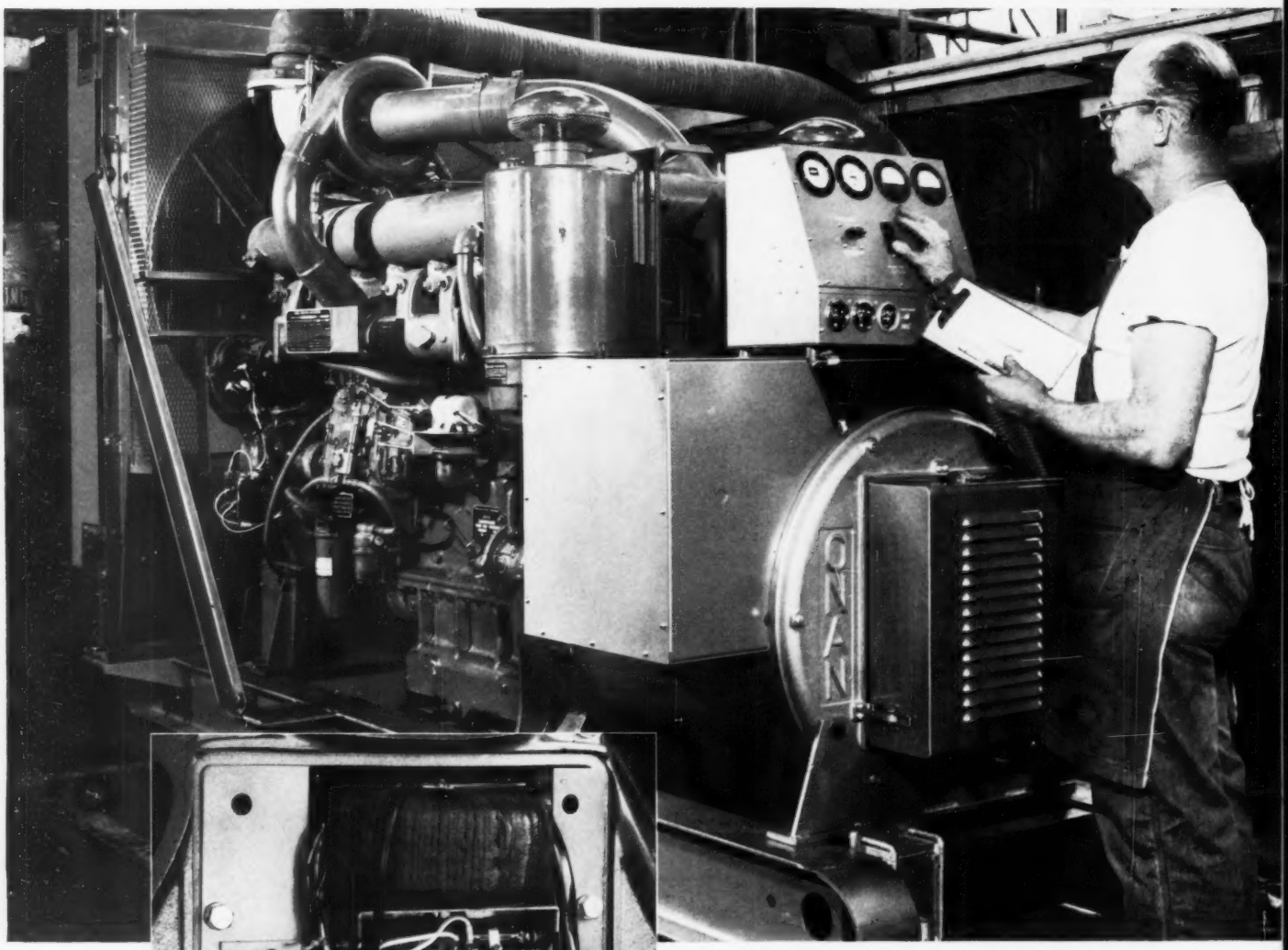
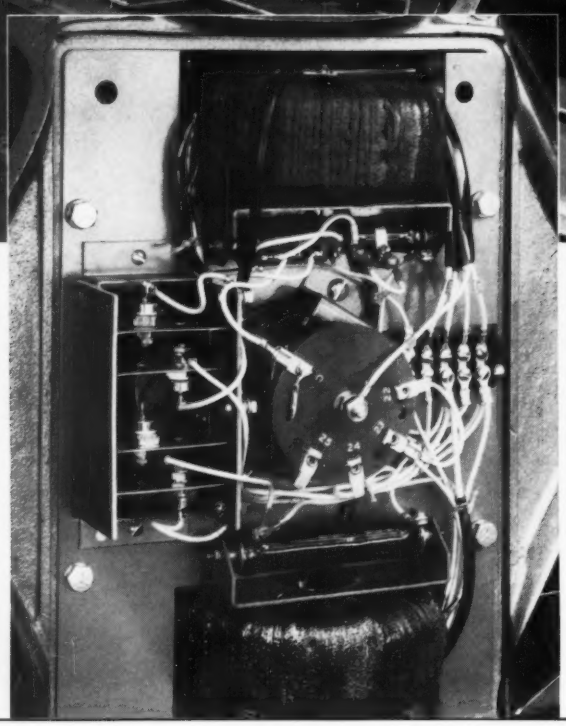
Pour on the load!

recovers voltage





Use Magneciter-equipped Onan for standby or primary power. Takes maximum starting load without hesitation! Available on all diesel and gasoline-powered Onan Electric Power Plants rated at 25 KW and up.

Static exciter and magnetic amplifier and regulator of Magneciter Generator with cover removed. No moving parts in this *static* exciter and regulator. No extra sensitive adjustments needed. Magneciter means reliability!

Onan Magneciter
within 1 second

Even when maximum starting load is applied, Onan Magneciter gives voltage recovery 5 times as fast as ordinary rotating exciter generator

When a heavy starting load causes a voltage dip, the Onan Magneciter Generator restores full voltage within one second. Old-fashioned rotating exciter generators take more than five times longer. Furthermore, Onan Magneciter has no moving parts in its exciter and voltage regulator, thus eliminating hundreds of potential causes of wear.

It's no longer necessary to buy a generator much larger than your normal power needs just to get enough extra power for the heavy drain of starting motors. Onan gives you this margin of power, builds it into every Magneciter-equipped Onan Electric Plant.

Every Onan Electric Plant is given hours of running-in and testing under load before it is shipped. An independent testing laboratory retests Onan Plants and certifies Onan testing methods—double assurance that every Onan lives up to its nameplate rating. Only then can Onan qualify for its Performance Certification.

Every Onan is ready to give you long-lasting performance and operating economy. See your Onan representative. You'll find him in the Yellow Pages. Or write direct.

ONLY ONAN GIVES YOU THIS CERTIFICATION

PERFORMANCE CERTIFIED
We certify that when properly installed and operated this Onan electric plant will deliver the full power and the voltage and frequency regulation promised by its nameplate and published specifications. This plant has undergone several hours of running-in and testing under realistic load conditions, in accordance with procedures certified by an independent testing laboratory.
D. W. ONAN & SONS INC.
Minneapolis 14, Minnesota
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World's Leading Builder of Electric Power Plants

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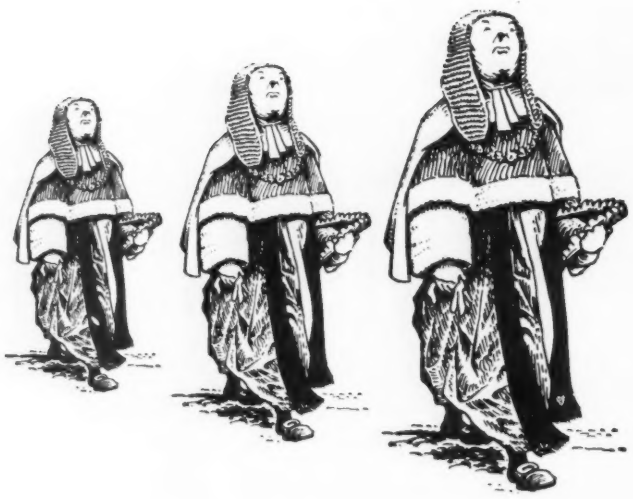


The Legal Aspect

DR. MELVIN NORD
Registered Engineer
Attorney at Law

The Limited Partnership

THE PRINCIPAL OBJECTION to allowing corporate practice by professional persons is that it inherently decreases their personal responsibility to their clients and interferes with their normal fiduciary duty. One big reason advanced for allowing corporate practice in the case of engineers is that it sometimes is necessary to raise capital, which is difficult in the case of the ordinary partnership type of firm. A solution to this problem may be found in the form of business organization known as the limited partnership.

Limited Partnerships

Limited partnership statutes have been enacted in every state. Approximately two thirds of the states have adopted the Uniform Limited Partnership Act. The others have statutes which are basically the same, but which vary in their particular details.

The fundamental aspect of a limited partnership is that the persons conducting the business (the general partners) are partners in the ordinary sense, but there are also one or more investors in the business (limited partners) who do not participate in the management of the business. They are merely investors.

The general partners have unlimited liability to creditors, as in the case of ordinary partnerships, while the limited partners' liability to creditors is limited to the amount of their investment. The limited partner is not a mere creditor of the business (like the bondholder of a corporation), but is an owner of a share of the business (like the shareholder of a corporation). However, like a shareholder of a corporation, the limited partner does not own any particular partnership property, but merely owns an undivided share of the overall partnership assets. Thus, he is entitled to receive a share of the profits while the business is operating, and to a return of capital and undistributed profits upon dissolution of the firm.

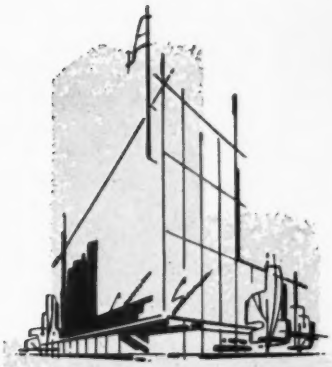
So long as the limited partner's name is not used as part of the firm name and he does not actually enter into the management of the business, he is not personally liable for acts of the firm, except for his investment.

The limited partner's interest is assignable — in a manner somewhat similar to the sale of a shareholder's shares in a corporation. However, the assignee of a limited partner is not necessarily himself a limited partner in the fullest sense (under the Uniform Limited Partnership Act), although he has the same right to participate in profits and to return of capital. Upon dissolution, he has no right to require any information or account of the partnership transactions or to inspect the partnership books. On the other hand, a substituted limited partner is fully a limited partner in every sense. Such a substitution can be made if all the other partners agree to the substitution, in which case the certificate (or formal filed record of the limited partnership) is amended to show the substitution. Alternatively, if the original certificate expressly allows a limited partner to make such a substitution on his own motion, it can be made without the consent of the other partners. Thus, care should be exercised in the wording of the certificate.

Unlike an ordinary partnership, the death of a limited partner does not automatically dissolve the firm. On the other hand, like an ordinary partnership, death of a general partner normally does dissolve the firm. However, this need not be so under the Uniform Limited Partnership Act if the certificate provides for the continuation of the business in such an event, or

the remaining general partners

Curtis cools



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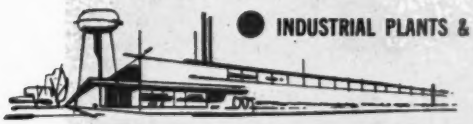
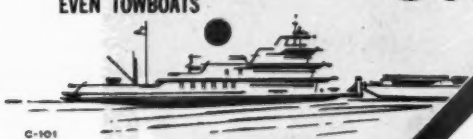


OFFICE & APARTMENT BUILDINGS

HOTELS & MOTELS BANKS & CHURCHES

etc.

EVEN TOWBOATS



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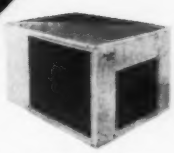
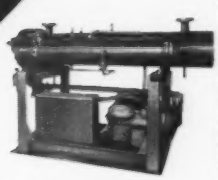


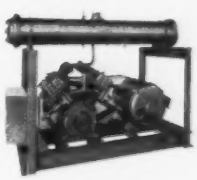
Packaged Air Cooled Conditioning Units 3 thru 10 Tons

Packaged Air Conditioning Units 3 thru 60 Tons



Packaged Liquid Chillers 7½ thru 125 Tons

Matching Evaporative Condensers, Cooling Towers and Air Handling Units



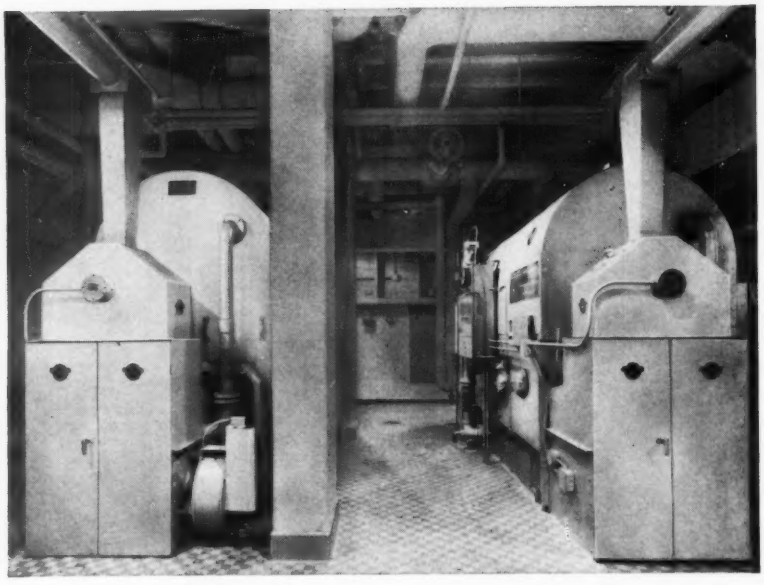
Condensing Units 3 thru 100 Tons

And in all applications—Curtis units perform dependably, always up to and frequently surpassing rated capacity. Key thing to remember is this . . . Curtis manufactures a complete line of units ideally suited to any application facing the engineer or mechanical contractor. Space saving, versatile Curtis equipment delivers dependable performance in installations of all types . . . and you will find the cost very much in line. This equipment allows for easy installation and servicing.

THE COMPLETE LINE OF LIQUID CHILLERS • PACKAGED AIR CONDITIONERS • CONDENSING UNITS

Curtis *Established 1854*

MANUFACTURING COMPANY • REFRIGERATION DIVISION • *Dept. 3, St. Louis 33, Missouri*



COAL ECONOMY + PACKAGE EFFICIENCY WITH THE COAL-PAK AUTOMATIC

All the advantages of a package water tube generator plus the economy of bituminous coal . . . that in brief is the significance of the Coal-Pak Automatic, developed in conjunction with Bituminous Coal Research, Inc. Fully automatic controls regulate coal feed, combustion and ash removal with cleanliness and efficiency which cannot be matched.

One of the many outstanding installations of Coal-Pak Automatics is in the new Coal Building, Washington, D. C., headquarters of National Coal Association. In addition to their heating role, the two 71-hp package units illustrated generate low-pressure steam which activates the absorption-type air conditioning system. Be sure to see this trend-setting Coal-Pak installation when you are in Washington, D. C.

Coal Building
1130 Seventeenth St. N. W.,
Washington 6, D. C.

For full information about the remarkable economy of International-BCR Coal-Pak Automatic units, write today for Bulletin 1100.

IBW BOILER BUILDERS SINCE 1886

THE INTERNATIONAL BOILER WORKS CO.

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Steel Firebox Heating & Power Boilers Low & High Pressure Water Tube Package Boilers • International-LaMont Forced Recirculation Generators • ASME Code Pressure Vessels & Welded Products.

agree to continue the business. Thus, the element of continuity may be introduced.

Additional limited partners may be taken in from time to time, to the extent allowed by the certificate, in a manner similar to the issuance of additional authorized stock in a corporation.

Just as with a corporation's shareholders, priorities or preferences may be established among limited partners (e.g. preferred shares versus common shares of a corporation). Also, as is true of the corporate stockholder, a limited partner is not entitled to profits until creditors of the firm have been paid in full.

Creation of a Limited Partnership

Unlike an ordinary partnership, a limited partnership cannot be formed by mere informal agreement of the parties. A formal instrument (a certificate much like the charter or articles of incorporation of a corporation) must be filed in a specifically designated public office.

Under the Uniform Limited Partnership Act, the certificate must contain the following information:

¶ The name of the partnership.
¶ The character of the business.
¶ The location of the principal place of business.
¶ The name and place of residence of each member; general and limited partners being respectively designated.
¶ The term for which the partnership is to exist.
¶ The amount of cash and a description of and the agreed value of the other property contributed by each limited partner.
¶ The additional contributions, if any, agreed to be made by each limited partner and the times at which or events on the happening of which they shall be made.
¶ The time, if agreed upon, when the contribution of each limited partner is to be returned.
¶ The share of the profits or the other compensation by way of

In Theory Anyone Can Make Lighting Fixtures to RLM Standards

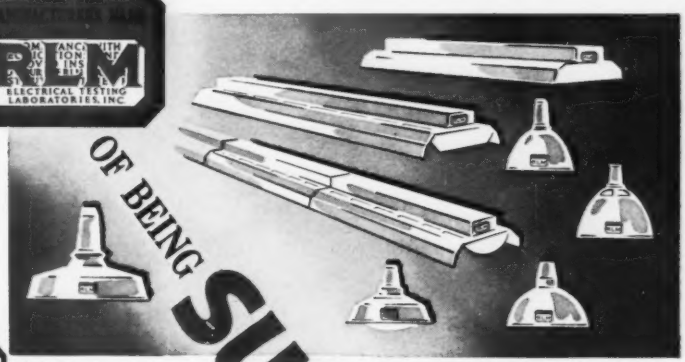
BUT

only RLM-Labeled fixtures are guaranteed to meet these standards, a guarantee made possible only by both the MANUFACTURER and the Certification Program of THE ELECTRICAL TESTING LABORATORIES

THE FINAL INGREDIENT

You often hear the question, "Is it equal to RLM?"... or you see in specifications the words: "RLM or Equal"... of course, theoretically it is possible to meet RLM Specifications. It is in the *guarantee* that the RLM Label cannot be equaled! The heart of the RLM Label is in its warranty of conformance to these RLM Specifications. This guarantee of the manufacturer to buyers is based not on specially submitted samples to a laboratory or an outdated test... but on a continuous, current testing and certification program conducted by the independent and world famous ELECTRICAL TESTING LABORATORIES OF NEW YORK.

OF BEING SURE



Types of RLM-Labeled equipment available from each of the 22 participating manufacturers is shown in the chart.

INCANDESCENT RLM SPECIFICATIONS

#1	#2	#3	#4	#18	#40	#41	
4	2	1	2		3		ABOLITE
4	4	2		1			APPLETON
5	4	4					BENJAMIN
5	1						ELECTRO
4			2				MILLER
4			3		3		MULTI
4	4	3					OVERBAGH & AYRES
6	4	6	3	2	2		QUADRANGLE
5	3	3					SMOOT-HOLMAN
4	1		1				SPERO
5		2	2		4	2	STEBER
4	1	1			1		WAKEFIELD
5	4	2		2			WESTINGHOUSE
3	4	1					WHEELER-FULLERTON

*Aluminum Reflectors all others are Porcelain Enamel

FLUORESCENT RLM SPECIFICATIONS

UPLIGHT → 8-20%			→ 10-20%			→ 20-30%					
D-1	D-1	D-1	D-2	D-2	D-2	D-3	D-4	SD-1	SD-1	SD-1	SD-1
✓	✓	✓	✓	✓	✓			✓		✓	BENJAMIN
✓	✓	✓	✓	✓	✓			✓	✓	✓	CURTIS-ALLBRITE
✓		✓	✓			✓		✓	✓	✓	ELECTRO
✓	✓		✓								ENDER-MONARCH
✓	✓	✓	✓	✓	✓			✓	✓		KEYSTONE
								✓		✓	LIGHTING DYNAMICS
✓											MILLER
✓	✓	✓	✓	✓				✓			RUBY-PHILITE
✓	✓	✓	✓	✓	✓			✓	✓	✓	SMOOT-HOLMAN
✓	✓	✓	✓	✓	✓			✓	✓	✓	SUNBEAM
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	SYLVANIA
✓	✓	✓									WAKEFIELD
✓	✓	✓	✓	✓	✓			✓	✓	✓	WESTINGHOUSE
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		WHEELER-FULLERTON
✓	✓	✓	✓	✓	✓						WORK-O-LITE

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PRODUCT QUALITY
LIGHTING QUALITY

These TWIN QQ's to Industrial Lighting Success are guaranteed with all lighting equipment bearing the RLM Label. Write for FREE RLM Specifications Book.

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If you need a grating that must fit around pipes and other objects, like a complicated jig-saw puzzle, there's one way you can be sure of getting panels that will fit perfectly into place—specify IRVICO.

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EST. 1902

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1856 10th St., OAKLAND 20, CALIFORNIA

income which each limited partner shall receive by reason of his contribution.

¶ The right, if given, of a limited partner to substitute an assignee as contributor in his place, and the terms and conditions of the subsitution.

¶ The right, if given, of the partners to admit additional limited partners.

¶ The right, if given, of one or more of the limited partners to priority over other limited partners, as to contributions or as to compensation by way of income, and the nature of such priority.

¶ The right, if given, of the remaining general partner or partners to continue the business on the death, retirement, or insanity of a general partner.

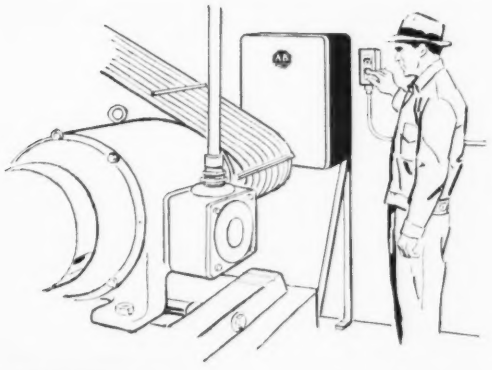
¶ The right, if given, of a limited partner to demand and receive property other than cash in return for his contribution.

These conditions are certainly not any more onerous than those involved in the creation of a corporate form of organization.

Use of the Limited Partnership

The limited partnership type of business organization is rarely used, since the corporate form of business is currently preferred. Normally, there is no reason for setting up a limited partnership instead of a corporation. About the only exception is where a rule of law forbids the use of the corporate form of business organization. Thus, the principal user of the limited partnership form of organization at present is the stock brokerage firm. It obviously requires capital, but is not permitted by law to operate as a corporation.

It is suggested that the same should be true in the case of engineering firms. The professional status of engineers can be fully maintained by the use of this form of business organization, but capital can be raised in substantially the same manner as it is raised for a corporation. ▲▲

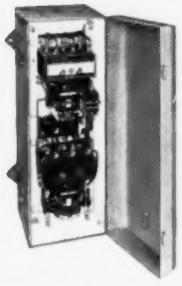


WHEN REDUCED VOLTAGE STARTING IS A MUST

Only Allen-Bradley can provide all the answers

The Allen-Bradley line of reduced voltage starters makes possible a selection of the best starter, not only to meet the power company's requirements but also to provide the best starting conditions for the motor and the "load" that it drives.

The simple solenoid contactors in A-B reduced voltage starters have only ONE moving part—assuring millions of trouble free operations. And their double break, silver alloy contacts never need costly maintenance. Accurate, reliable overload relays protect motors against burnouts. Write for Publication 6088.

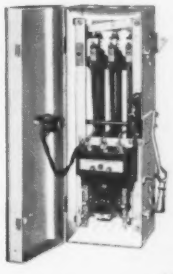


Bulletin 740

Graphite disc resistors are automatically inserted in series with the squirrel cage motor at starting, and they are automatically cut out after a predetermined time. Turning a single screw on the starter frame adjusts the compression resistors exactly to motor and load conditions for velvet smooth acceleration. Ratings to 200 hp, 220-440-550 v.

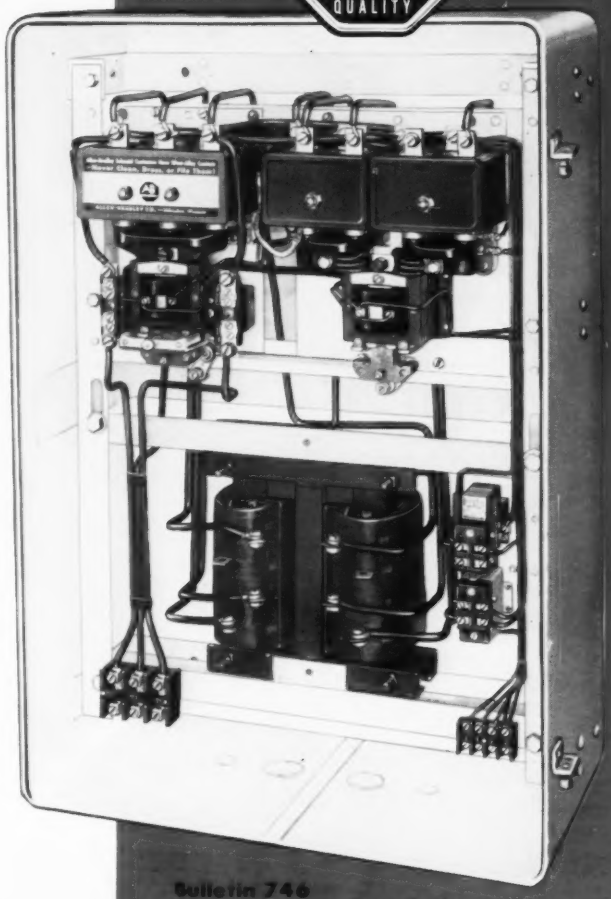
Bulletin 640

Where remote control is not needed, these graphite compression disc resistor starters provide stepless acceleration of squirrel cage motors. Operated by hand lever, the smooth starting of the motor is under the control of the operator. No-voltage and dependable overload protection is provided. Ratings to 200 hp, 220-440-550 v.



22-60-M

A-B QUALITY



Bulletin 746

Automatic reduced voltage starter for squirrel cage motors that should not be started on full line voltage. It employs autotransformer connected in open delta to reduce line voltage during starting. Adjustable timing relay controls starting period. Taps are provided on the autotransformer to adjust the starting voltage applied to the motor. Ratings to 300 hp, 220 v; 600 hp, 440-550 v.

ALLEN-BRADLEY

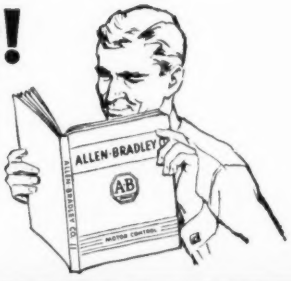
Member of NEMA

Quality Motor Control

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis.
In Canada: Allen-Bradley Canada Ltd., Galt, Ont.

Some more special controls that are "standard" with Allen-Bradley!

Even Khrushchev couldn't claim a more complete line!



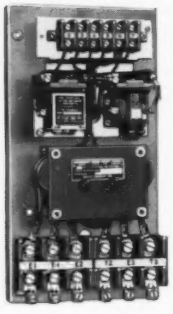
A-B QUALITY

Phase Failure Phase Reversal Relays

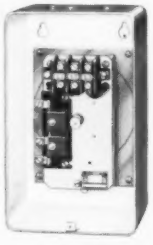
The Bulletin 812 Style RF relay responds to *all* open phase conditions on a branch motor circuit and immediately removes the motor from the line. Also, the motor is disconnected when a phase reversal occurs anywhere in the system on the line side of the relay. "Fail safe" design.

Phase Failure, Style F covers f.l. currents from 1.5 to 300 amp in 4 sizes. Coils to 600 v, 60 cycles.

Phase Reversal, Style R made with coils for 110, 208/220, 440, 550 v for either 50 or 60 cycles.



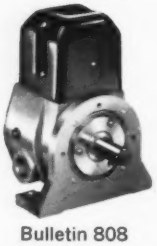
Bulletin 812 Style F



Bulletin 812 Style R

Zero Speed Switch

Used for "plugging" duty, these switches prevent coasting and bring squirrel cage motors to a sudden stop. Also used to prevent application of reverse power before motor comes to a full stop. Adjustable operating speed.

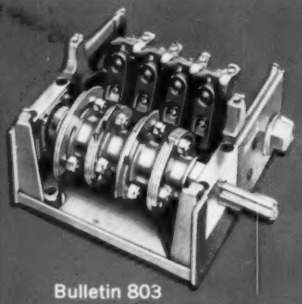


Bulletin 808

Low Pressure Switch

Especially designed for domestic water pump service and commercial air compressor service. These inexpensive compact switches offer pressure ranges from 15 to 200 psi.

Bulletin 830



Bulletin 803

Rotating Cam Limit Switches

Heavy-duty pilot controls used on rotating machines to initiate functions at any point of rotation. Made with up to 12 individually adjustable, independent circuits.

Bulletin 805

Foot Switches

Built for toughest service. Has maintenance free, snap-action contacts. Extended base prevents tipping. Made with hood (left), with top guard and without guard.

Bulletin 836 Style T

Pressure Controls

Oiltight enclosure for machine tool hydraulic systems operating at pressures up to 5000 psi. Operating pressure and differential are adjustable. Indicator shows trip point. Silver contacts never need service attention.

Bulletin 837 Style A

Temperature Controls

Newly designed bellows provides lower differentials. Rugged construction permits continuous cycling from zero to maximum setting. Vibration or mounting angle will not affect accuracy of operation. Temperature ranges from —150°F to 490°F.

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis.

In Canada: Allen-Bradley Canada Ltd., Galt, Ont.

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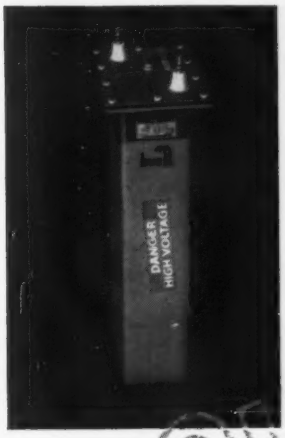
22-60-R



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BONUS LIFE

As a public service to those in business and industry who are responsible for the protection of lives and property from the hazards of fire

FIRE RESISTANT INCOMBUSTIBLE FLAME RETARDANT FIRE PROOF PROVE IT! FLAME-PROOF NON-FLAMMABLE

MATERIALS FOR PROTECTION OF THERMAL INSULATION AGAINST FIRE DAMAGE

FIRST, to clear up a common misconception about materials used to protect thermal insulation; no coating, sealer, or adhesive can by itself prevent fire damage. In fact, certain products without fire-retardant properties many times will actually cause fire and flames to spread; while products containing fire-retardant properties can at best only retard the spread of flames by the reduction of available fuel.

Over the years many ambiguous and ill-defined terms have been used to describe fire resistant properties of materials in literature, specifications and other published data. Words and phrases such as incombustible, flame-proof, non-flammable, fire resistive, and even fireproof have been attached to products used for the protection of thermal insulation. In many cases where the use of these terms was based on unrecognized and inadequate test methods, the products actually fed fuel to the flames rather than retarding them.

The only accepted measure of fire hazard in coatings is the flame-spread value. The confusing phrases used above do not give in exact terms the flame-spread value. If the confusion is to be eliminated, Industry must adopt a standardized system of testing and terminology for use in Engineering Specifications.

The use of confusing terms can be discarded by the adoption of the rating standard known as the Flame-Spread Index, accepted and used by building codes and insurance underwriters. There are two test methods accepted by Industry for determining flame-spread values. These are the Underwriters' Laboratories' "Tunnel Test" (ASTM E84) and the National Bureau of Standards "Radiant Energy Test" (Interim Federal Standard .00136–Com. NBS). With either of these established methods, flame-spread values ranging from zero to over 200 can be determined with accuracy for all coatings, adhesives and sealers used with thermal insulation materials.

An example of flame-spread values:

A totally incombustible material such as portland cement would have a flame-spread value of zero, while a self-extinguishable synthetic resin product could be rated about 60, and a violently combustible nitrocellulose product would be rated at "over 200."

Here, also, are the flame-spread values of some popular insulation weathercoatings applied over calcium-silicate insulation:

VAPOR BARRIER ASPHALT MASTIC	
Product A	175
Product B	173
Foster C. I. Mastic 60-26	170
FIBRATED ASPHALT EMULSION MASTIC	
Product A	218
Product B	200
Foster H. I. Mastic 90-07	150
FIBRATED POLYMER EMULSION MASTIC	
Product A	290
Foster Sealfas Mastic	40
FIRE RESISTIVE VAPOR BARRIER MASTIC	
Foster Fire Resistive Mastic 60-60	35

The Solvent Problem

Flame-spread values of solvent type mastic weathercoatings are determined under solvent free conditions to simulate service conditions existing after the products have been applied and all traces of solvent have evaporated. However, during application and cure, a fire hazard will exist when flammable solvents are contained in the coating. Such solvents having a flash point lower than 100° F. are flammable and easily ignited by welding sparks, matches, electrical sparks, cigarettes, etc. Thus a product, whose flame-spread index under solvent free conditions is relatively low, could well be the cause of a disastrous fire while it is being applied if it contains a flammable solvent.

Therefore, for complete fire safety, where welding and other sources of sparks and flame cannot be avoided during application of coatings and adhesives, these products should be chosen not only for their ultimate flame-spread value, but also for their formulation with non-flammable solvents (for example, Foster Fire Resistive Mastics).

Recommendations

We urgently recommend that engineers who specify fire resistive coatings, sealers and adhesives for use with thermal insulation specify maximum acceptable flame-spread values and flash points of materials. Only by rigidly adhering to such specifications will owners, their inspectors, buyers and applicators obtain fire safe thermal insulation construction.

A Word of Caution

The mere publishing of a flame-spread value is insufficient evidence on which to choose a product. Where two products, equivalent in every other respect, are offered for fire safe service, a product with a flame-spread value of 6 should unquestionably be chosen over a product whose index is 44. *Relative* flame-spread values, then, become of vital importance in choosing fire-retardant products.

Purpose

We at the Benjamin Foster Company have been devoting many years to research, study, manufacture and promotion of fire safe products for use in the protection of thermal insulation. We have adopted a firm policy regarding our promotion of fire safe products which is:

"To cooperate with all interested individuals and organizations in the establishing of a standardized system of testing and rating true flame-spread value . . .

To publish information that will be factual and in accordance with accepted practices . . .

To avoid overemphasis of disaster conditions in the promotion of fire safety . . .

To continue our research and development of products with improved fire safe characteristics."

If there is any way we can be helpful to you or your organization in a better understanding of products for use in the protection of thermal insulation, please contact your nearest Foster Representative, or write Benjamin Foster Company, 4635 W. Girard Avenue, Philadelphia 31, Pa.

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DIVISION OF AMCHEM PRODUCTS

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BONUS PROTECTION

from the Boiler Capital of the World

THE TITUSVILLE WTP
FROM THE BOILER CAPITAL OF THE WORLD

• BONUS LIFE means longer life and less refractory maintenance made possible by Titusville's unique WTP design featuring *65% Black Surface Tube Area coverage on rear wall.*

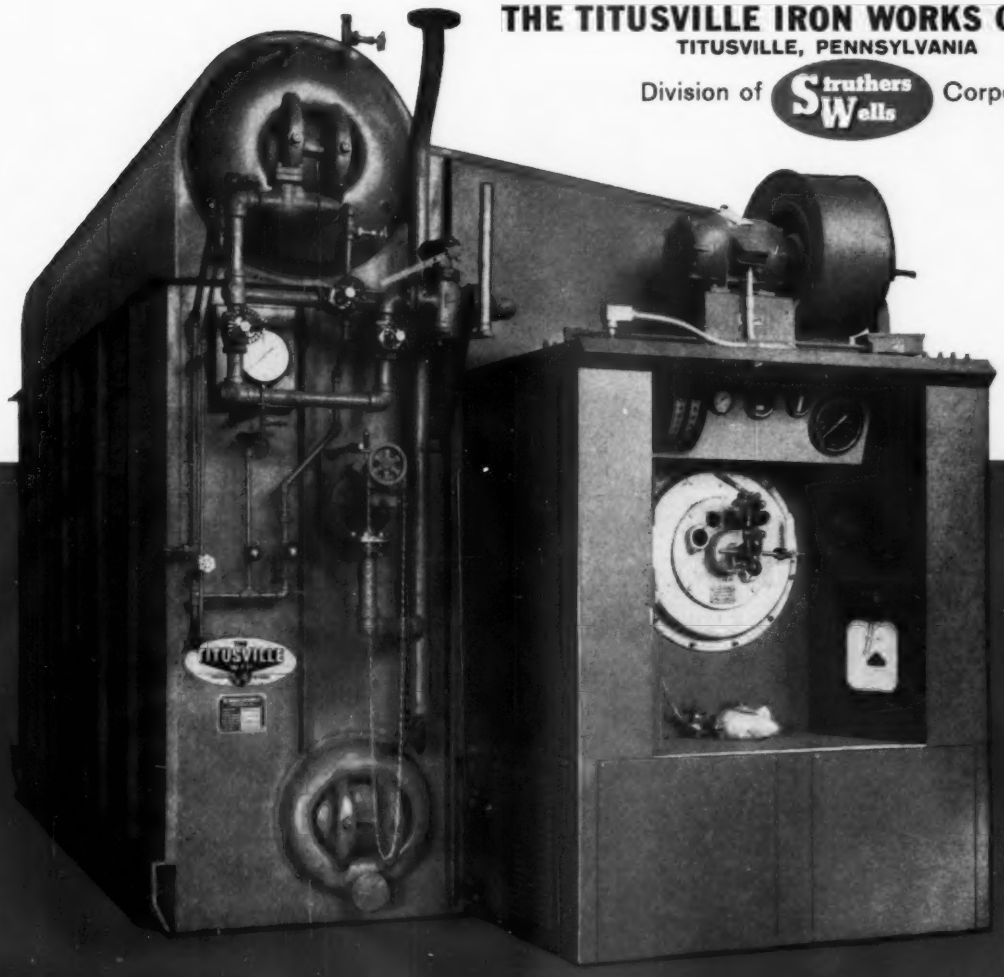
Titusville's increased black surface tube area means less refractory maintenance through longer refractory life (less down-time for replacement) and a faster steamer.

• BONUS PROTECTION provided by Titusville WTP's *double casing design* solves the corrosive product problem.

Most water tube steam generators operate intermittently. When dew point is approached at low fire condition, corrosive product can form quickly in single casing boilers.

Titusville WTP's double casing design (with insulation between) reduces temperature differential. Result: formation of corrosive product almost entirely eliminated for many times more casing life.

THE TITUSVILLE IRON WORKS COMPANY
TITUSVILLE, PENNSYLVANIA
Division of Struthers Wells Corporation



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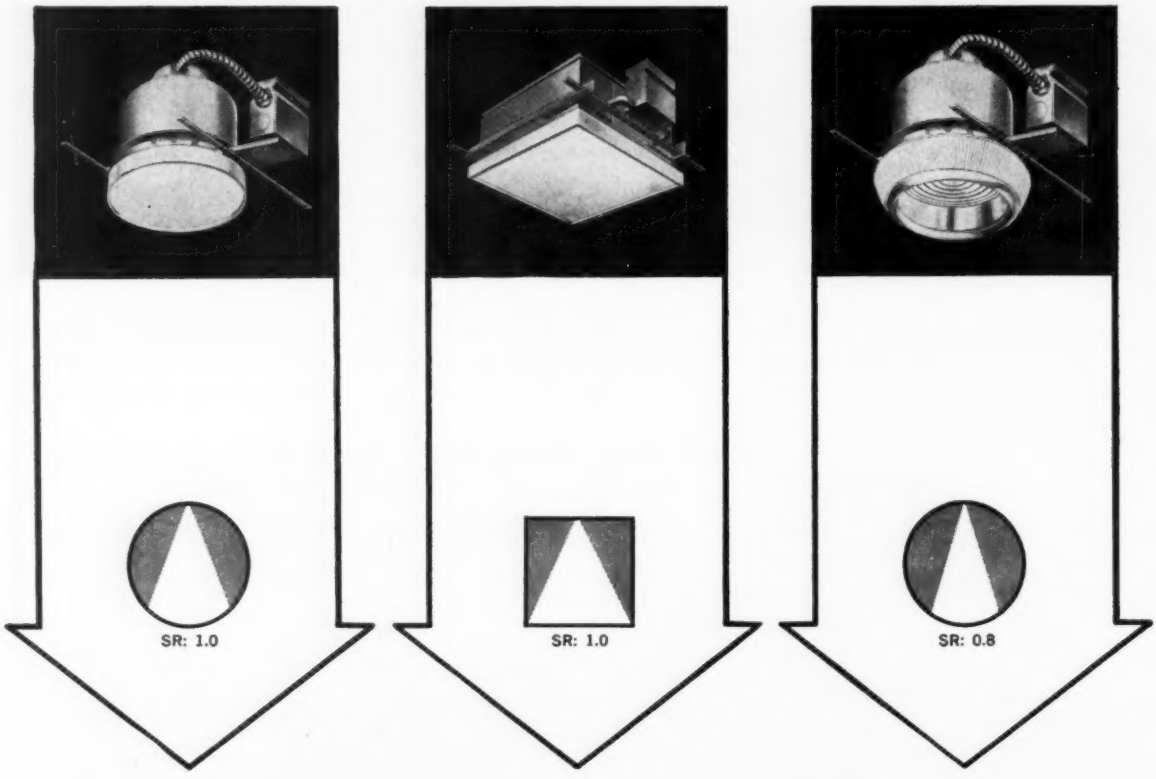
BONUS LIFE
and
BONUS
PROTECTION
specify
WTP
from Titusville

This is the embodiment of a design philosophy . . . a blending of function with aesthetics . . . a precisely engineered approach to every downlighting need. The product is *Calculite*, an impressive collection of 18 models of recessed incandescent fixtures . . . a total of 96 sizes and finishes, shapes and capacities. Each is designed for a *predictable* lighting effect, a particular design

DOWNLIGHTING EFFECTS



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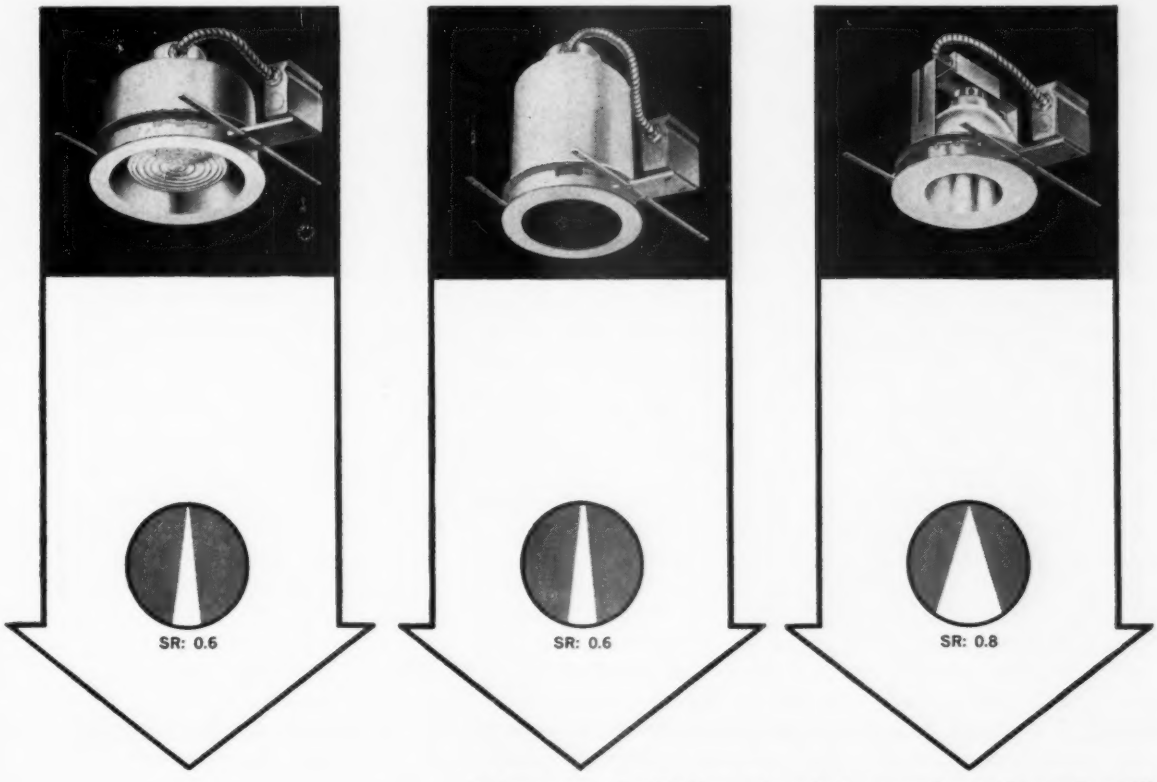

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Heard Around Headquarters

MARJORIE ODEN,
Eastern Editor

Consultants' Liability

In the first appellate decision of its kind in California, it has been ruled that a consulting engineer has clear limitations insofar as his liabilities are concerned.

The case (Bonadiman-McCain Inc. vs. Snow) involved a licensed civil engineer and a contractor who were jointly suing to recover for the balance due on a sub-division. The civil engineer was also president of the corporation which was the contractor.

The judge ruled that: "The engineer's undertaking in respect to the plans he prepares is comparable to that of an architect, which in the absence of a special agreement is not an absolute guaranty that satisfactory results will ensue. The services of experts are sought because of their special skill. They have a duty to exercise the ordinary skill and competence of members of their profession, and a failure to discharge that duty will subject them to liability for negligence. Those who hire such persons are not justified in expecting infallibility, but can expect only reasonable care and competence. They purchase service, not insurance."

EJC-AIA Liability Report

Engineers Joint Council is publishing the first report to come from the joint EJC-American Institute of Architects committee — "Profession-Liability and Responsibility." Although EJC is to circulate the voluminous report, it has been "accepted," not "approved." AIA was scheduled to discuss their attitude toward the report at a meeting later last month.

Co-chairmen of the committee compiling the lengthly report were John F. Hennessy Sr., who represents the Consulting Engineers Council in EJC, and William W. Eshbach, representing the AIA.

Documents studied at length were the AIA owner-architect agreement; AIA general conditions of practice; AIA contractor-owner agreement; National Society of Professional Engineers engineer-architect agreement; American Society of Mechanical Engineers standard form of contract between architect and engineer; CEC standard form of agreement between owner and engineer; and the CEC standard form of agreement between architect and engineer. Detailed recommendations for changes were made on all documents.

The committee, which recommends that architects and engineers get together on their standard documents, reported the NSPE forms "most effectively integrated with the Standard AIA Forms."

Also, after comprehensive study, the committee was "appalled by the casual arrangements which exist between architect and engineer, especially in view of the present-day complexity of a building project and the percentage of the work which is related to the mechanical and electrical systems."

In addition to the quite comprehensive study of standard documents, the report contains a checklist by which a consulting engineer or an architect can tell if their errors and omissions insurance is as adequate as they think.

The committee began by noting that, legally, architects and engineers often are sitting ducks.

"It is generally known that since the termination of World War II, liability cases have increased in number and the amounts of monies awarded to the injured parties in such cases are also increasing.

"Four basic factors have contributed to this situation:

¶ The volume of construction and, therefore, the opportunity for error has increased at a rapid rate.

¶ Much of our current work involves public projects and public money and, as a consequence, any point in question can readily become a major issue — as compared to the same point in question relative to a private client.

¶ The individual project is technically and otherwise more complex, and larger in size.

¶ The general attitude of the courts and the trend in settlements and awards.

"Probably one of the major factors which has contributed to delaying our day in court has been the excellent Standard Documents and Forms developed by the professional organizations."

Institute Dinners

The American Institute of Consulting Engineers usually holds an annual dinner in conjunction with the American Society of Civil Engineers annual meeting in New York City. However, this year ASCE met in Boston. So the Institute held a Boston dinner (with John B. Fisher, administrative and

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Con Edison's power generating station in Astoria, Long Island, one of the largest of its kind in the world, supplies one-eighth of the power consumed by New York City's millions. An installation as vital as this naturally requires the utmost protection to insure efficient, uninterrupted operation—around the clock, around the calendar. And this is where Thomas A. Edison's OMNIGUARD system provides such an important contribution.

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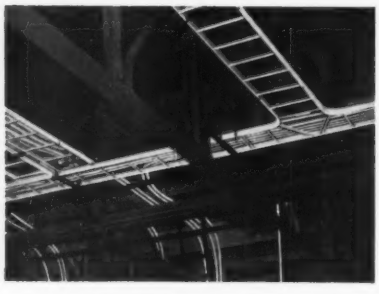

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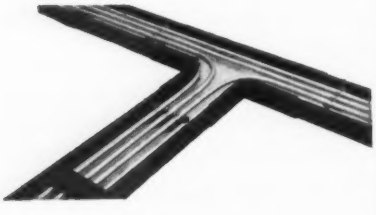

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legislative consultant as speaker), but it also will hold an annual dinner in New York City.

The next dinner — Nov. 29th at the Waldorf-Astoria — is at the same time in the same city as the American Society of Mechanical Engineers annual meeting. However, this is reported to be coincidence rather than a change in Institute policy. Speaker will be General Lucius D. Clay, chairman of the board of Continental Can Company.

Sub-Professional Placement

Last year, the New York State law was amended to allow engineers to join lawyers, architects, nurses, and other professional groups in being allowed to operate an employment service for professional society members without being considered an agency. So in setting up the Statewide Employment Facilities, the New York State Society of Professional Engineers has been defining the scope they would cover. They considered providing sub-professional employees (draftsmen and designers) as a service to consulting engineer members.

However, at a recent convention in Upstate New York, it was decided NYSSPE would be "acting beyond the scope of its powers by attempting to conduct a referral service or employment bureau for anything but the practice of engineering and surveying. Subprofessional employees do not come within the interests of the Society."

A New National Academy?

A National Academy of Engineering (see October 1960, "Heard Around Headquarters") has gone from the discussion stage to a direct request for funds. Anything in the engineering profession moving this fast is really news.

A committee, with representatives of the Engineers Joint Council, the National Academy of Science, the Engineering Foundation, and Engineers Council for Professional Development, has asked the Engineering Foundation for $10,000 and its executive secretary, Dr. Harold Work. During the investigation, Dr. Work would explore operation of similar engineering academies in other countries.

EJC Computer Program

The Engineers Joint Council has formed an Information Processing Committee, charged with helping to pass computer data from one member association to another.

Although the program is a good idea, it is little more than that at present. The only member organization which has started a computer programming "library" is the American Institute of Chemical Engineers, which began about one year ago. It has been proposed that the Engineering Societies Library house a central computer programing exchange in the future, but the proposal did not meet with much initial enthusiasm.

To Form CEC Committee

Worried over the "wide open" corporate practice which would be allowed with adoption, by any state, of the new Model Law, the Consulting Engineers Council is appointing a committee to study corporate practice provisions of the various state laws and to help the Council take appropriate action when laws are being considered. The revised Model Law, as adopted in Oregon by the National Council of State Boards of Engineering Examiners last August, allows corporate practice by corporation "agents, employees, officers, or partners."

The Council is not opposed to corporate practice per se, but believes that control of engineering corporations should be in the hands of registered engineers.

The Standard School Plan

As a result of the bill passed in New York State last year approving the use of standard school plans, John K. M. Pryke was asked by the New York Association of Con-

engine power
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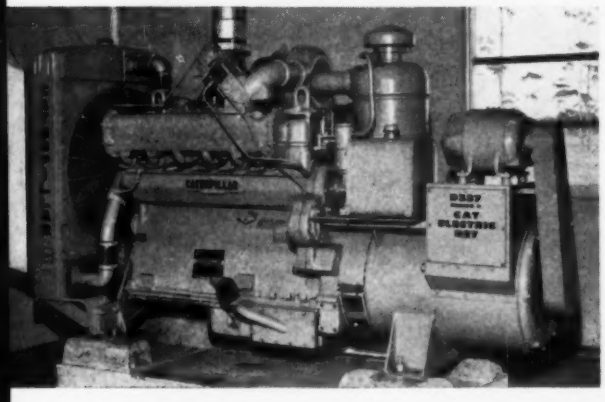
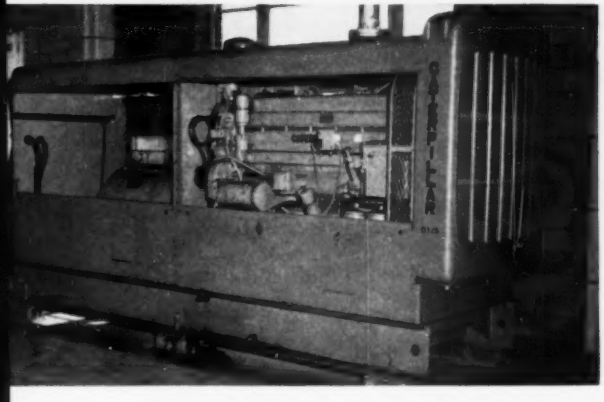
Prime power—
Emergency power...

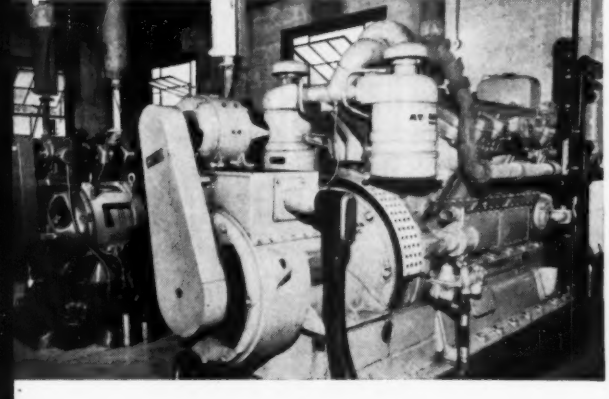
Cat D337 Electric Set in Plant D of Public Utilities Department at Fort Lauderdale, Florida.



Cat D326 Diesel Electric Set is used for standby power at Water Department in Warren, Ohio.



Cat 397 helps furnish power for the village of L'Anse, Michigan, which has a population of 2400.



Whatever the job,
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In water works, sewage plants, or electric utilities, Caterpillar Engines prove their worth. In the town of L'Anse, Michigan, Caterpillar Diesels furnish power for a population of 2400. "I've been running Caterpillar Engines in our power plant for 20 years," the superintendent says. "During that time we've had only the best from the engines themselves and our Caterpillar Dealer."

At Plant D of the Public Utilities Department in Fort Lauderdale, Florida, Plant Supervisor Vernon Sheesley says, "Although our plant is relatively new, we are well satisfied with our Caterpillar Diesel Electric Set and the excellent service given by our Caterpillar Dealer."

At the water purification plant of the City of Warren, Ohio, three Caterpillar Diesels give dependable power—a D326 Electric Set is used for standby power in the purification plant, a D397 is on a standby pump to keep up water supply when electric pumps are down, and a D318 pumps water from reservoir to purification plant automatically on a low service pump at reservoir.

Superintendent J. Paul Price said that Caterpillar "had the product which was most suitable for this operation. Specifications were set up first and after the bids were in, it was found that Caterpillar equipment met the specifications best."

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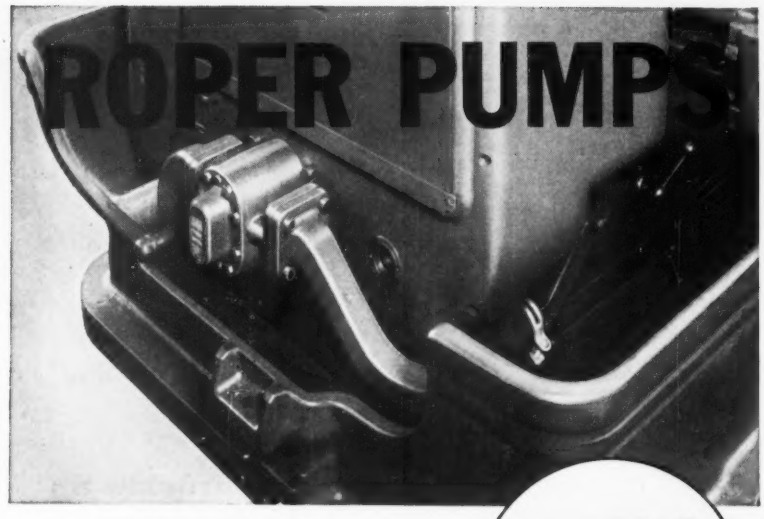

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sulting Engineers to learn how the use of such plans is affecting consultants elsewhere. After extensive investigation, Pryke reports that there has been little effect.

Ralph Westcott, former Consulting Engineers Council president, wrote that California has a similar bill but it has made little difference in the practices of architects and engineers.

Westcott explained that "California law provides that the State Division of Architecture shall receive and file copies of all school plans which fall within their jurisdiction, the theory being that this file of plans would then be available to any school district for review as to the suitability of any of them for their specific needs. If one of these prefiled plans were to be adopted by a school district, they would then hire an architect or an engineer for site adaptation for their specific use.

"In actual practice, the pool plan has not been implemented by the State Division of Architecture and the best information . . . is that substantially none of the schools have been built from plans previously prepared for another district or site. Therefore, the operation of this pool plan has not affected the California architects or engineers with respect to school work. All school work is being bid on an original design basis."

Headquarters Building Quotas

Three organizations have gone beyond their quotas for the new Engineering Headquarters Building, and now there is talk that they might want some money reappropriated. The lucky three are the American Society of Civil Engineers, the American Institute of Chemical Engineers, and the Institute of Industrial Engineers.

As ASCE sees it, fund raising cost them in excess of $15,000. An estimated $100,000 is to be spent decorating their portion of the new building. (As William H. Wisely, executive secretary, explained it,

Detroit Stokers satisfy industrial, institutional and heating needs on every continent of the earth.

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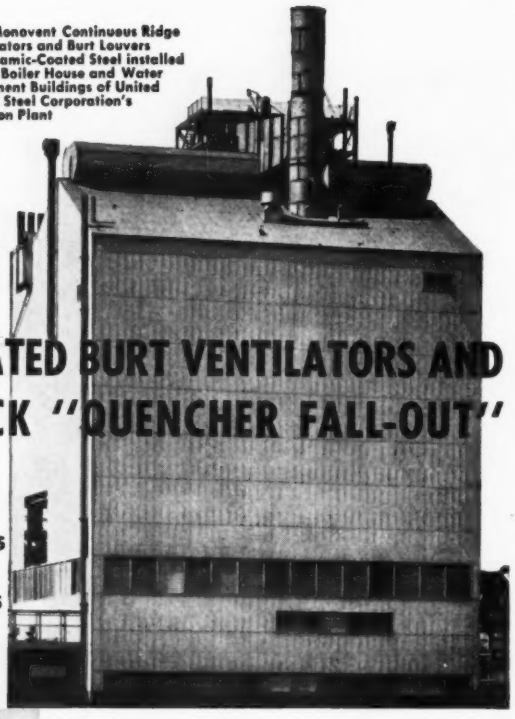

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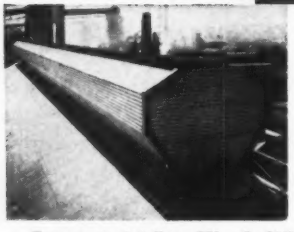
End Hazardous Maintenance Problems in World's Largest Coke and By-Products Plant



Two runs totaling 75' of 96" Burt Continuous Monovent are installed on the Boiler House. 101' of 48" Burt Continuous Monovent Ventilators serve the Water Treatment Plant in this photo.

4,268 sq. ft. of Burt Adjustable Louvers and 635 sq. ft. of Burt Fixed Louvers are in the installation. Illustrated is a 16' x 24' Fixed Louver in the transformer Room Wall.

Coke areas have probably the greatest roof and ventilator replacement in steel mills. At the United States Steel Corporation's Clairton Works, the Boiler House and Water Treatment Plant, because of prevailing winds, are subjected almost constantly to quencher fall-out.

Tests show that V-Corr ceramic-coated sheets are fully resistant to emission acids, rust and salt. The Burt ventilators and louvers, of ceramic-coated steel and stainless steel, assure long, trouble-free operation under probably the most highly corrosive conditions in the country.

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partitions alone will cost about $37,000. "And we have not bought any new furniture in years, making what we had last regardless of its appearance until we moved.")

The three lucky societies hope additional needed "expense money" might be contributed by members if they knew the funds would help their individual organizations.

Electricals to Include Scientists

The American Institute of Electrical Engineers is losing no time in becoming the first of the Engineering Founder Societies to include science, mathematics, and physics graduates among its membership.

In September, the Engineers Joint Council granted permission to constituent societies to include scientists as well as engineers in their membership and still take part in EJC activities. The question was scheduled, independent of EJC, for discussion by the Electricals at their Chicago meeting last month.

This is only one in a series of changes the Electricals are making – with an eye toward keeping up with the future technology of the profession. The Electricals long have disliked being labeled as a group interested primarily in electric power.

The new scientist members must be "qualified under instruction and supervision to undertake research, design, instruction, operation, or manufacture in fields closely related to electrical engineering." Student membership also has been opened to science students who are "preparing for careers in electrical engineering and other closely related fields."

The AIEE bylaws have been rewritten, and a number of constitutional amendments proposel. The board will meet at the beginning – not the close – of future meetings. More detail is to be handled by the executive board, which meets at the end of sessions.

The office of technical vice-president has been created, with a future vice-president to represent

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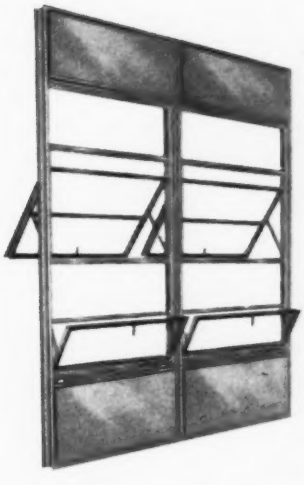

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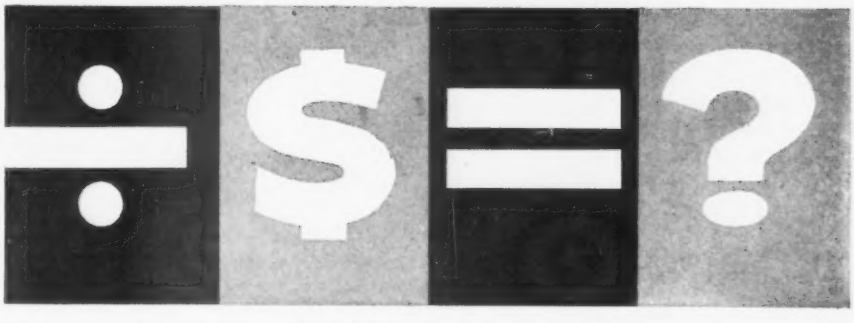

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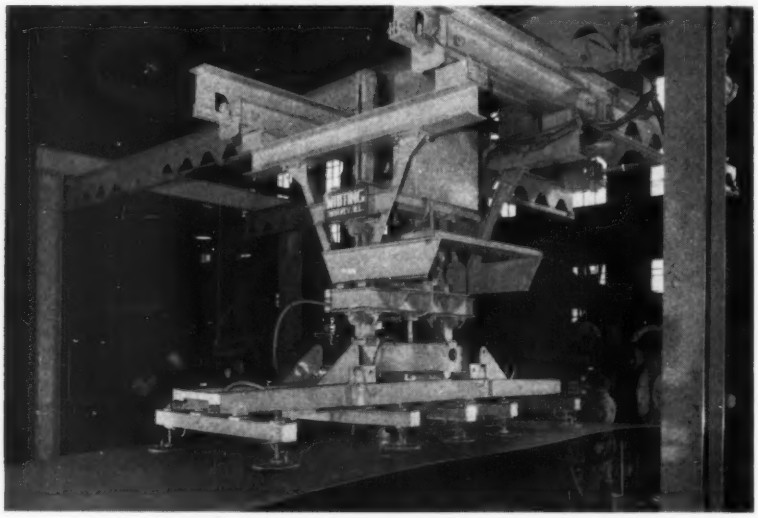

Feeding heavy steel plate into a shear was tough, tedious work at Pullman-Standard. Men were hard to get for the job and twice as hard to keep. Pullman called on Whiting engineers to discuss the problem.

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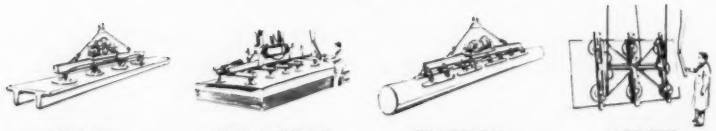

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The office staff also is being enlarged. Ivan S. Coggeshall, a past president of the Institute of Radio Engineers, now is manager of the Technical Operations Division. In January, J. W. Morrison, a graduate of Massachusetts Institute of Technology, will become coordinator of student activities.

Hospitality for Visitors

The visitors' program of the New York City Chapter of the American Society of Civil Engineers is almost one year old, and well on its way toward becoming a permanent fixture.

This program, established to extend a hand to foreign engineers visiting New York City, so far has helped 20 engineering groups (ranging up to 30 men per group) to see projects of their choice. Because ASCE members cannot always drop their own business of the day to escort the vistors personally, the program consists primarily of informing visitors what projects currently are of interest and getting the necessary clearance for the visitors to be admitted.

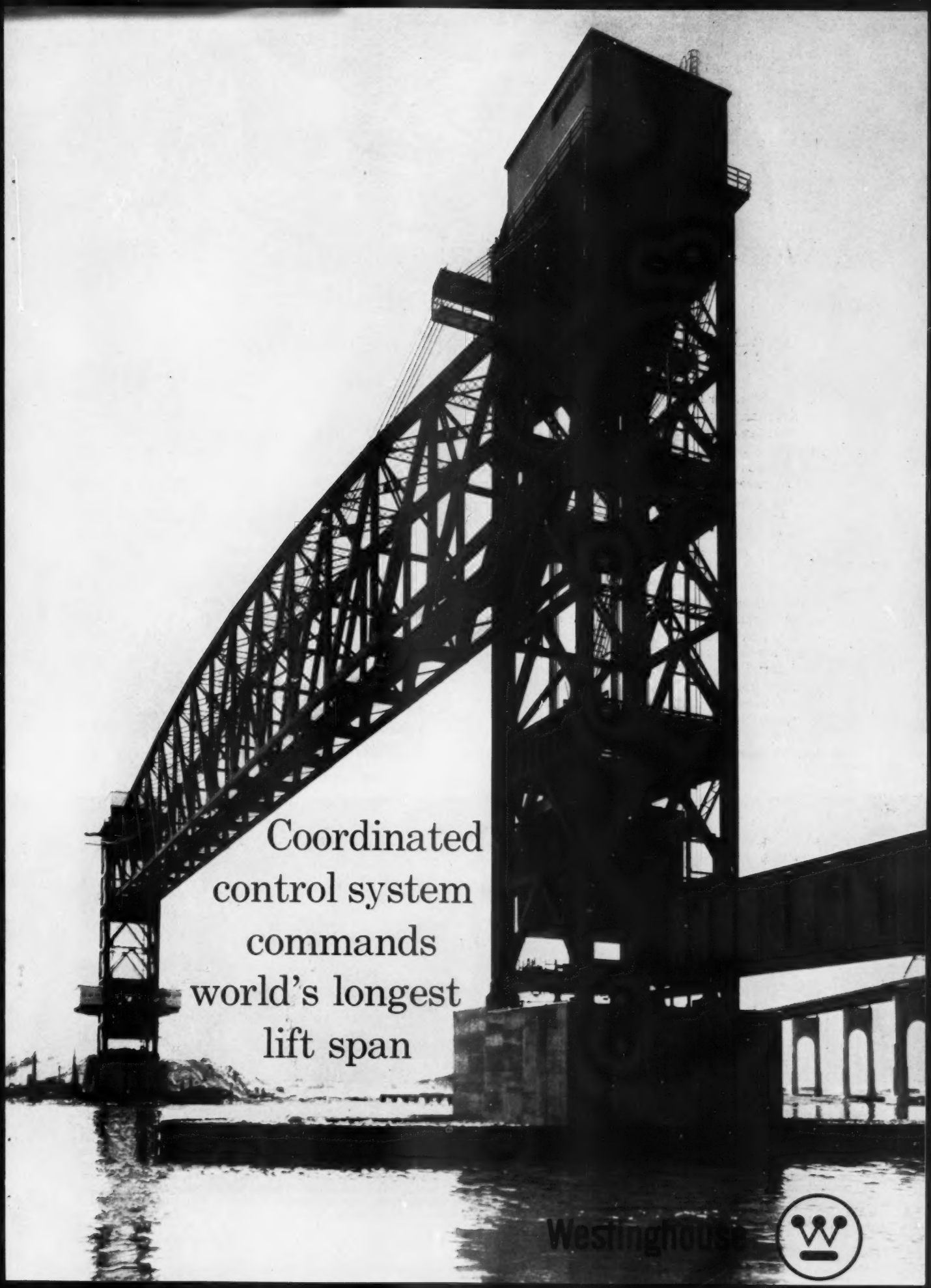
The New York City hosts have received inquiries from ASCE chapters in other cities who are interested in establishing similar programs for visitors.

Baltimore Firm Scores

A proposal for supervision of construction of a sanitary sewer improvement program from Whitman, Requardt & Associates of Baltimore recently resulted in a decision that the town of Williamsport, Md., will not require bids on engineering projects.

The Williamsport charter requires bidding for any "contractual services" in excess of $1,000. After receiving the Whitman, Requardt proposal, the town attorney ruled that the bidding requirement does not apply to professional services. The Baltimore firm got the job. ▲▲

ON COVER: The Arthur Kill Lift Bridge between Staten


Coordinated
control system
commands
world's longest
lift span
Westinghouse

ON COVER: The Arthur Kill Lift Bridge between Staten Island, N. Y., and Elizabeth, N. J., was designed by Parsons, Brinckerhoff, Quade & Douglas for The Staten Island Rapid Transit Railway Company (a wholly owned subsidiary of The Baltimore and Ohio Railroad Company) and built by American Bridge Division of the United States Steel Corporation. 1645 feet long over-all, the bridge is shown with its 558-foot central span in raised position.

Westinghouse electrical system gives precise, reliable control over vertical lift of 2,000-ton span

The new Arthur Kill Bridge boasts the longest vertical lift span ever constructed. The record length span replaces an old swing bridge whose center pier had become a navigational hazard. Westinghouse equipment quickly and smoothly elevates the span 104 feet to leave a 500-foot-wide clear navigation channel for the passage of ships—lowers the span for rail traffic.

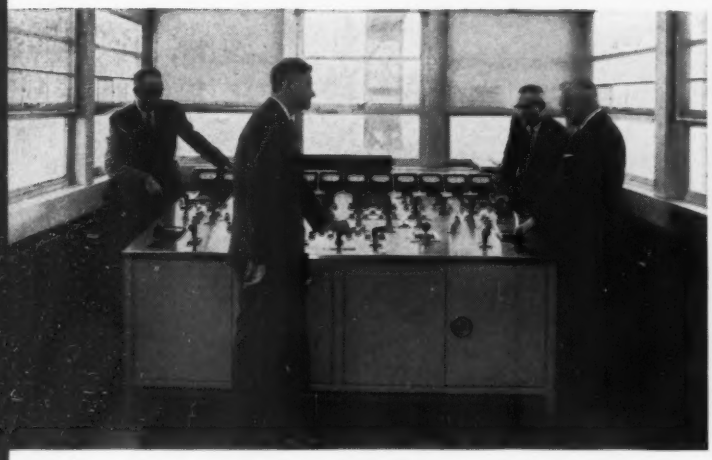
Suspended between two shore towers, the counterweighted main span is operated by giant cable sheaves driven through reduction gearing. Measuring 558 feet in length and weighing four million pounds, it can be raised or lowered through its 104-foot travel in approximately two minutes. The d-c adjustable voltage drive, furnished by Westinghouse, gives precision speed control and holds skew of the span to a minimum throughout the normal operation cycle.

Smooth acceleration to maximum speed and gentle controlled retardation to stop give the bridge every assurance of a long and useful life with a minimum of maintenance. Standardized d-c mill motors furnish drive power for span operation. Heart of the precision speed control is the Westinghouse Magamp exciter regulator. This simplified design uses the completely static Magamp and a single field rotating exciter to provide top performance with extremely low maintenance.

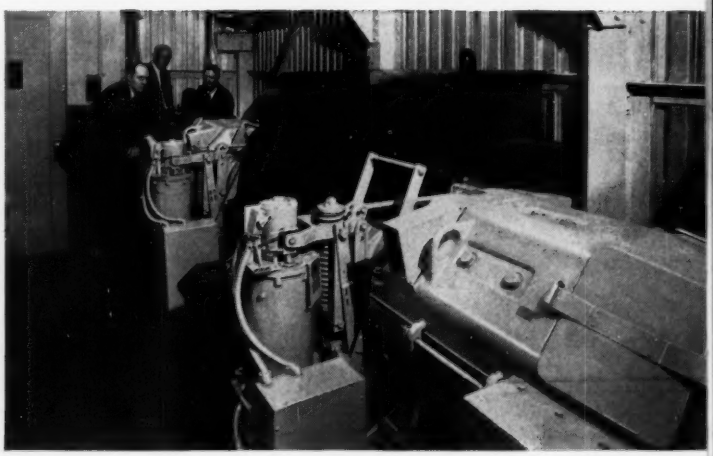
Drives in each tower are synchronized by a sensitive skew detection scheme which uses static elements to automatically reduce voltage to the leading motor and increase voltage to the trailing motor. This system can be expected to keep the two ends of the lift span within close limits of being perfectly level throughout its travel. To assure bridge operation under emergency conditions, a stand-by diesel engine generator set is installed. A duplicate drive system is also provided and is available at the option of the bridge operator at any time. *(cont'd)*

J-94150-A2

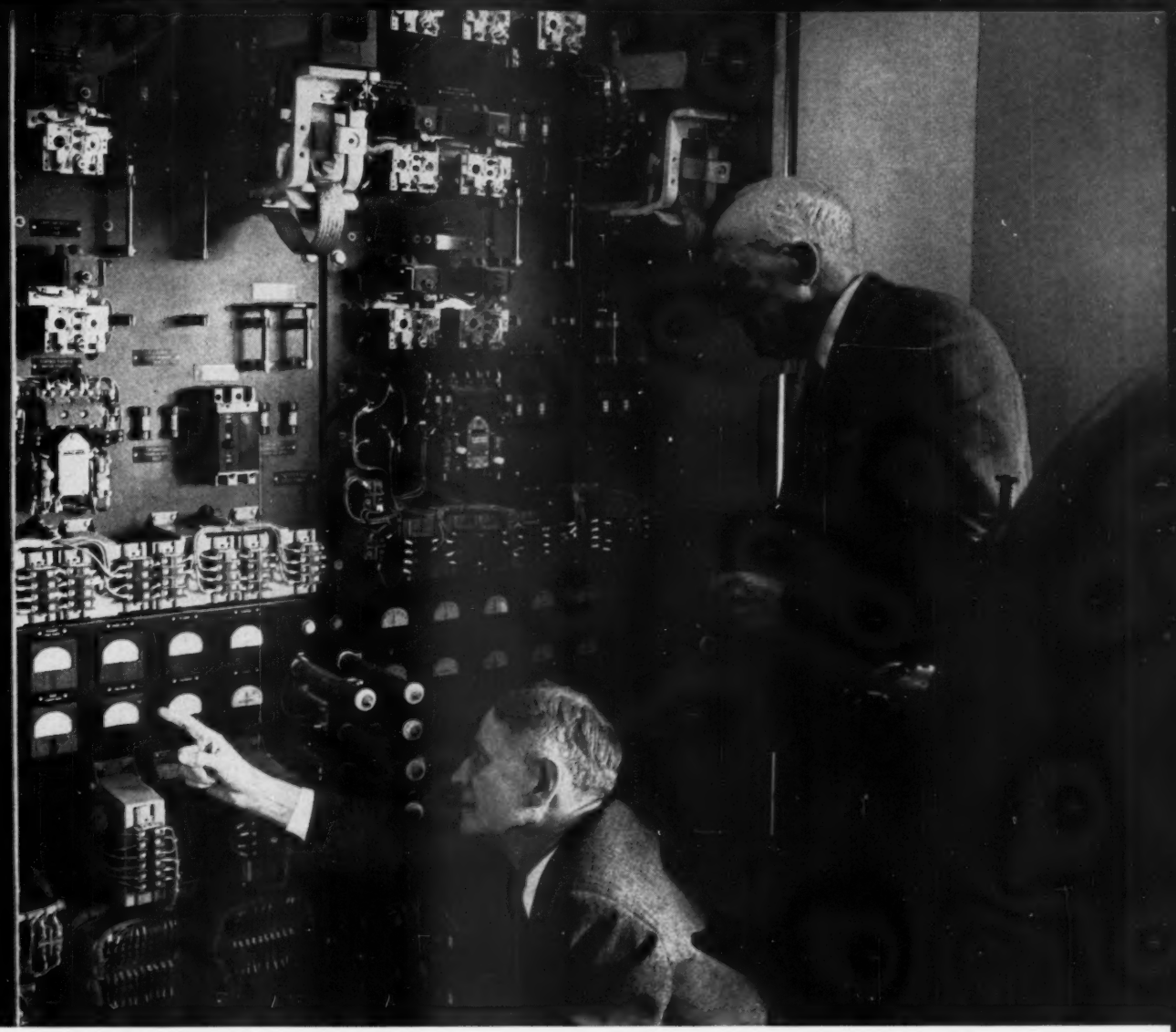
Westinghouse



View of main control room in east tower, showing desk from which operator controls all main and auxiliary bridge drives. Special instrumentation, including height and skew indicators, keeps bridge tender informed of all operating conditions. Drive system transfer and power source selection is made from this console. W. C. Carl explains conveniently grouped controls to N. L. Ziegler, Division Engineer (left); J. F. Stevens, Superintendent; and P. K. Partee, General Manager.

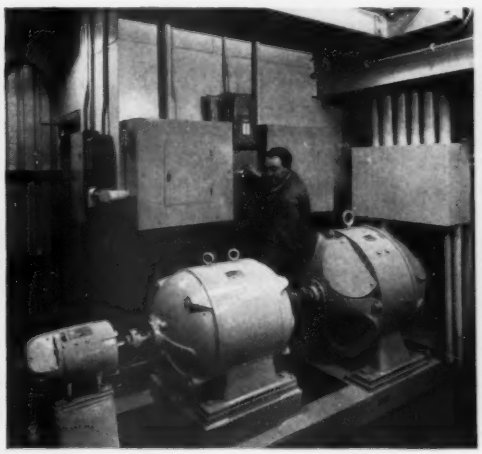


Discussing main drive equipment in east tower are M. B. Trimble, Westinghouse Construction Engineer; G. R. Keltie and W. C. Carl. Two type MCPA-614, 135-hp Westinghouse mill motors are shown above—one motor for each of the duplicate drive systems. Systems are arranged so that one motor in each tower can drive span at rated speed. These rugged, heavy-duty, standardized motors assure reliable operation under all conditions. Westinghouse type HI-198 thrustor brakes are used for holding bridge at standstill.



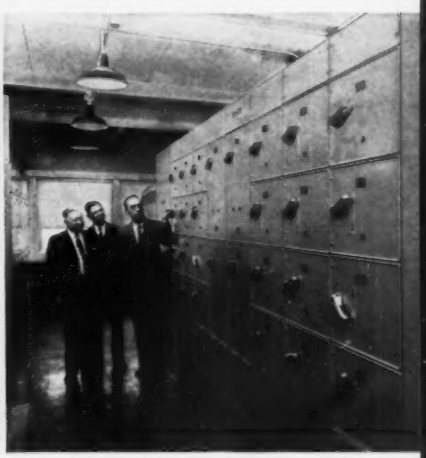
G. R. Keltie, Chief Substation Maintainer, The Staten Island Rapid Transit Railway Company, looks on as W. C. Carl, Westinghouse Construction Engineer, points out details of main d-c control panel. This panel contains type M, 800-amp d-c "loop" contactors, span speed, current limit and skew control Magamps with associated auxiliaries.

Incoming 4160-volt power is reduced to 480 volts by this 500-kva Westinghouse power center. Low-voltage switchgear at rear distributes power to main drive system and bridge electrical auxiliaries. Type DB drawout air circuit breakers provide feeder circuit protection. Discussing installation: John Pucillo, Staten Island Rapid Transit Railway Electrician; Max Pilger, Garfunkel Electric Supply Company; and M. Davis, Westinghouse Sales Supervisor.



John Pucillo is seen operating wall mounted AB-I breaker which controls machinery and room heaters. In foreground, main 125-kw type SK d-c adjustable voltage generator driven by 150-hp type CSP* motor. Generator excitation furnished by Magamp exciter regulator determines operating speed of main drive motors. Small unit at near end is a constant potential generator for drive motor fields and control auxiliaries. The d-c supply for duplicate drive system is furnished by identical equipment.

*Trade-Mark



A Westinghouse control center in the east tower switchboard room is examined by Messrs. Partee, Carl and Ziegler. It contains combination starters for 440-volt auxiliary drives and includes a-c relay panels at each end. Compact control centers are composed of interchangeable, space-saving, easily installed modular units.

J-94150-A3

Interesting view from mezzanine floor, showing one of four span control auxiliary assemblies. A single machinery take-off to the multiple speed gearbox provides correct ratios to operate type A cam limit switches, height, skew and control transmitters. This construction permitted unit preassembly at machinery builder's plant—assuring fast, easy installation. Seen above: W. C. Carl and G. R. Keltie.

Coordinated control system commands world's longest lift span *(cont'd)*

As supplier of the coordinated electrical systems, Westinghouse assumed complete responsibility for their performance. For more information about how this single-source supply can benefit you, contact your nearby Westinghouse construction sales engineer. Or write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pennsylvania.

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CONSULTING ENGINEER: Parsons, Brinckerhoff, Quade & Douglas, New York, N. Y.
GENERAL CONTRACTOR: American Bridge Division, United States Steel Corp., Pittsburgh, Pa.
ELECTRICAL CONTRACTORS: Fischbach and Moore, New York, N. Y.
Lightning Electric Service Co., Newark, N. J.
WESTINGHOUSE DISTRIBUTOR: Garfunkel Electrical Supply Co., Jersey City, N. J.

J-94150-A 4

Westinghouse

Freight train moving over the recently completed Arthur Kill Lift Bridge is drawn by a diesel engine of The Staten Island Rapid Transit Railway Company.

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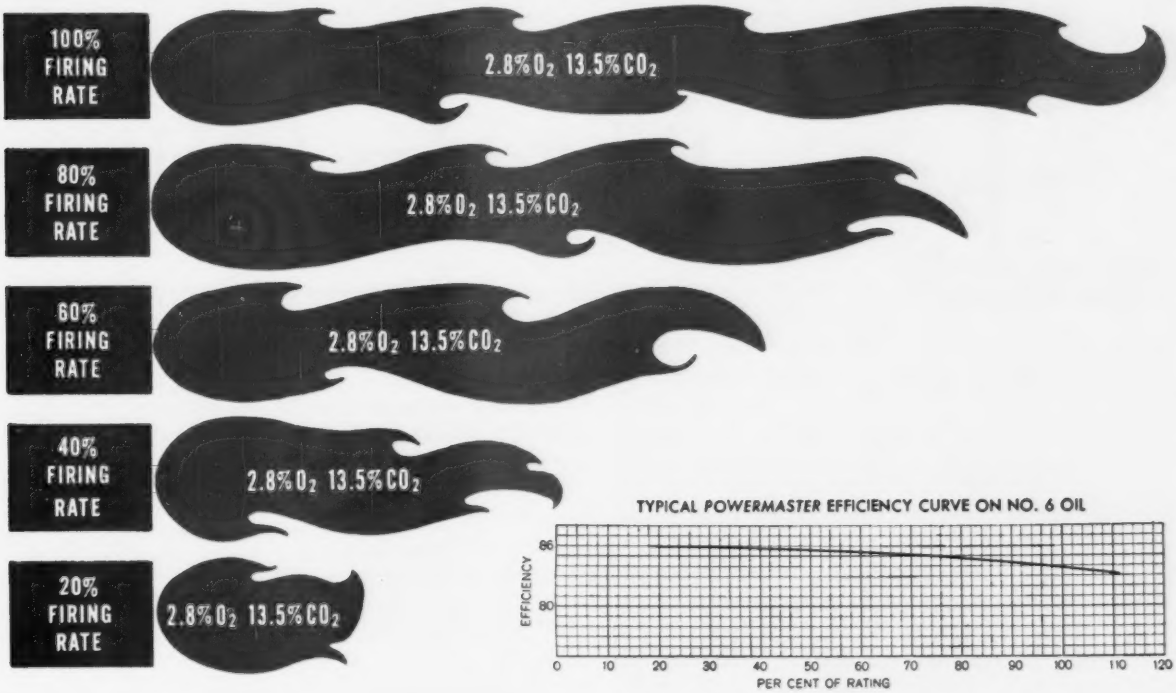

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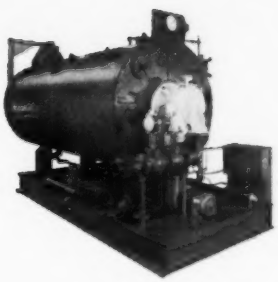

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The Readers' Guide

Public Relations
(page 91)

The rooster seemed to us an appropriate symbol for public relations. But not, as would seem at first glance, because of his crowing. For the rooster is an industrious fellow. He is first up and last to bed, handles a large flock of clients with firmness and diplomacy, speaks forcefully, and dresses well. All of these attributes can contribute to the public relations program of the consulting engineer, according to Richard B. Espey, a public relations counselor. He tells the consultant how to crow without being crass.

Soaring Sixties
(pages 26 and 142)

The fledgling efforts of the Soaring Sixties have barely been able to produce a flutter in the Nation's economy. But better times are coming for the consulting engineer. "From the Editor's Tranquil Tower," page 26, gives some good reasons why this will be so, if consulting engineers do as they should. On page 142, "Lee's Lecture" continues in the same vein, this time using economic data compiled by the Marplan Foundation to paint a rosy picture of what is ahead.

Employee Interviewing
(page 121)

The non-directive interview can degenerate into the poor man's psychiatric couch. But it is also one of the best techniques for finding out about a prospective employee. Eugene Raudsepp discusses the ways in which an employer can approach the non-directive interview to get the information he wants – without letting the conversation degenerate into pointless chatter. While it is the contention of some that interviewers are born, not made, Raudsepp's article will be of value to any consulting engineer who has to improve his hiring techniques.

Bring in the Contractor Early
(page 88)

The engineer often complains about the architect who brings him into project planning too late. According to Wayman Wing, the contractor often gets left out by both the architect and the engineer. Wing, of course, agrees that competitive bidding for construction work is likely to be to the owner's advantage on most jobs, but there are times, he feels, when the contractor can profitably be made a part of the preliminary design team. He tells how and when this should be done and illustrates his point with some successful examples.

Heating Coils
(page 100)

Most consulting engineers are aware of the difficulties encountered in designing temperature controls for heating coils that are operating most of the time in a range well below their design capacity. Donald McLeod discusses the control system design his firm has found most successful in giving clients the precise temperature they want.

Report from Hungary
(page 116)

How the Communists turned the screw on private practice in Hungary is the subject of Denes Gellert's article. It was a long, slow process, and Gellert was able to rise to the level of a bureau head while remaining politically uncommitted. Then, he was forced to leave Hungary following the 1956 uprising. He is currently at work with Dorfman & Schwartz, in Philadelphia.

The Railroads
(page 109)

It is no secret that the American Railroads are in trouble, and the comments of its many critics are often heard. Harry Brown, of Gibbs & Hill, is one of the few with a constructive approach. It is his contention that electrification can revitalize rail service, although he does not overlook the many other problems

Can you use the team and talents that solved this problem?

HOW DO YOU KEEP A SUBMARINE STABLE WHEN IT FIRES A POLARIS MISSILE?

IN THE DESIGN and construction of the Navy's Fleet Ballistic Missile Submarines, General Dynamics' Electric Boat Division encountered and solved many tough problems. For example: how to maintain positive buoyancy compensation when several tons of Polaris missiles are fired from a submerged submarine. As a missile is launched from a submarine, sea water floods into the empty missile tube adding considerable weight to the ship. Without a reliable means of promptly compensating for this extra weight, the ship cannot maintain depth control so necessary when firing missiles.

Thus the problem facing the designers of the Fleet Ballistic Missile Submarines at Electric Boat Division was to devise a system which would maintain the submarine stability while launching missiles from submerged positions.

Critical components in the system were the depth control, flood and blow valves which had to be reliable, compact and capable of rapidly transferring large volumes of sea water with a minimum loss of pressure head. Acute arrangement problems required the development of a two-way, three position flood and blow ball valve for use at the base of each of the sixteen missile tubes.

In addition, no suitable hydraulic actuator for the large three position ball valve was available. Commercial sources, after several months of study, were unable to develop an actuator which met the necessary reliability and rigid space requirements.

Electric Boat Division designers and engineers then proceeded to design and manufacture a ball valve and hydraulic actuator which solved the problem. As developed, the new ball valve-actuator combination met the special requirements. The actuator delivered constant torque over its entire operating range and accurately and positively indexed the output shaft at three positions (0°, 90°, 180°).

The same capability in hydraulic and mechanical design—that created the unique three position ball valve and hydraulic actuator—is now available to you. A special organization—the Industrial Services Department—has been established at Electric Boat Division to go to work on your problems and projects.

The Industrial Services Department is prepared to undertake tough jobs at any stage—from initial definitions and thinking to final installation and testing. (This includes any or all of the following: problem analysis, engineering, design, fabricating and manufacturing.)

Briefly, Electric Boat Division is ready to think it through—and do it too. Why not discuss your problems with us? Write:

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GENERAL DYNAMICS CORPORATION
ELECTRIC BOAT DIVISION, GROTON, CONN.

ELECTRIC BOAT DIVISION'S constant torque three-way actuator, mounted on a ball valve, incorporates two opposed piston racks which are moved by hydraulic pressure to rotate a pinion. Separate moving pistons are combined with the racks to limit mechanically and positively the angular position of the pinion, at not only 0° and 180°, but at any intermediate position.

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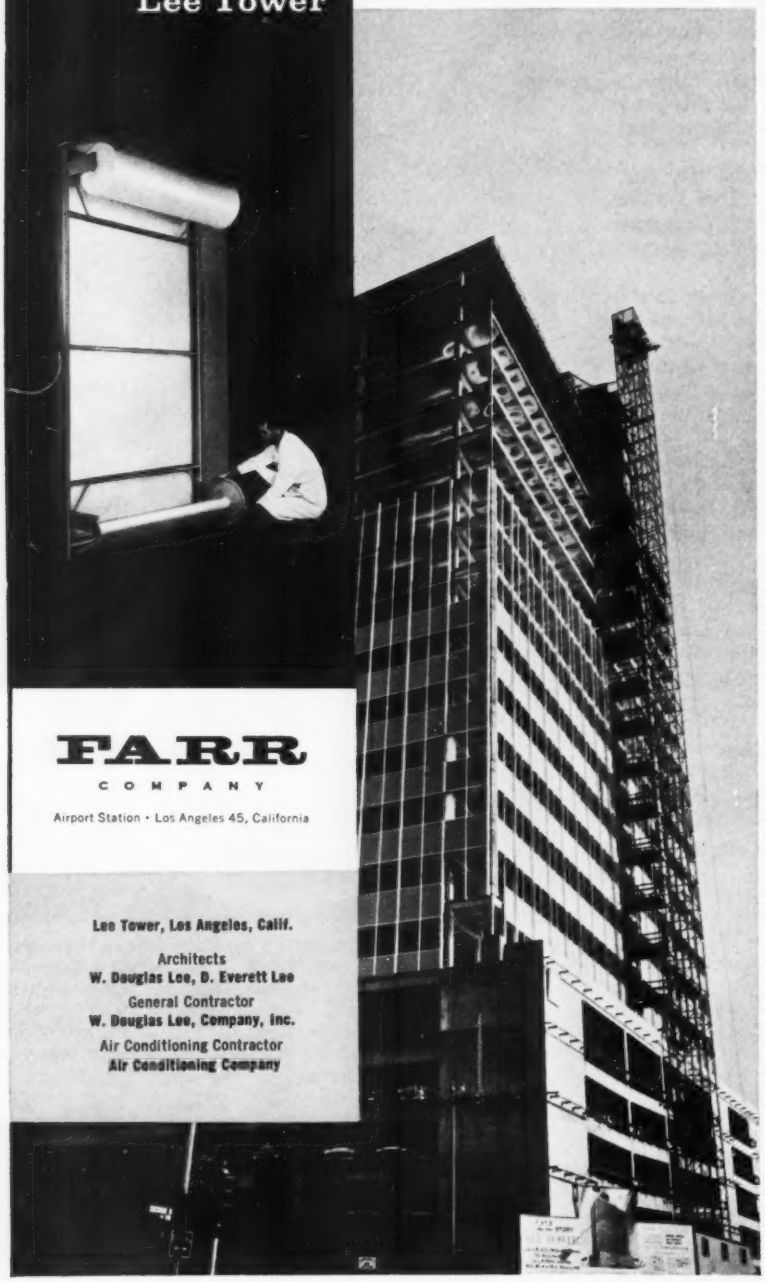

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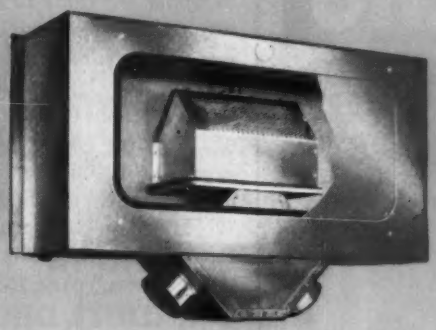
that will have to be solved before our railroads can get on the track. Brown has devoted a lifetime to the railroads, and his approach is based on extremely broad experience, in the United States and abroad.

A new approach to industrial zoning will interest consulting engineers. It will also allow better distribution of land between the warring factions of business and industry and residential users. Performance standards covering a wide range of nuisances can be established on a quantitative basis, and it is evident that they will eventually replace outmoded use lists. According to Marvin Salzenstein, this will call for a higher level of engineering in industrial design, but it will also make zoning laws less contentious. The article appears on page 104.

It took six years, $12 million, and untold hours of politicking and engineering to get New Yorkers back on the wagon in the 1830's. Having substituted booze for water in their daily diet, the City's residents did not really care about their water system until it was too dirty for clothes washing and in such short supply that the city was in danger of burning to the ground. By that time, water had become so important that on the day the Croton Aqueduct was dedicated, it is reported that there was not a single intoxicated person in the City. Naturally, such an important social and engineering triumph resulted in the publication of a book – by F. B. Tower of the New York Engineer Department. It is an interesting volume, and extremely well illustrated. Thus, CONSULTING ENGINEER was happy to be able to borrow one of the few remaining copies from the private library of Enoch R. Needles. From it we took some of the interesting illustrations which appear on page 94.

With Robert Moses at the helm, the next New York City World's



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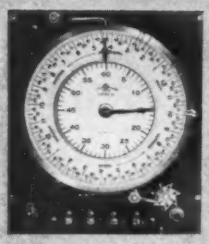
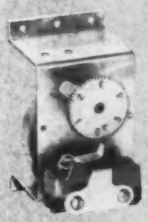
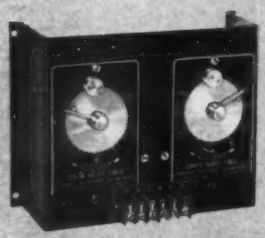


Program Clocks

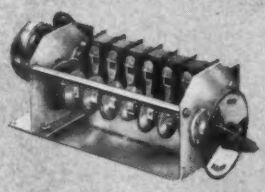
Interval Timers



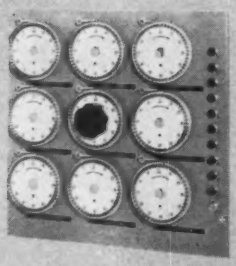
Time Delay Timers



Automatic Reset Timers



Multi-Circuit Cycle Timers



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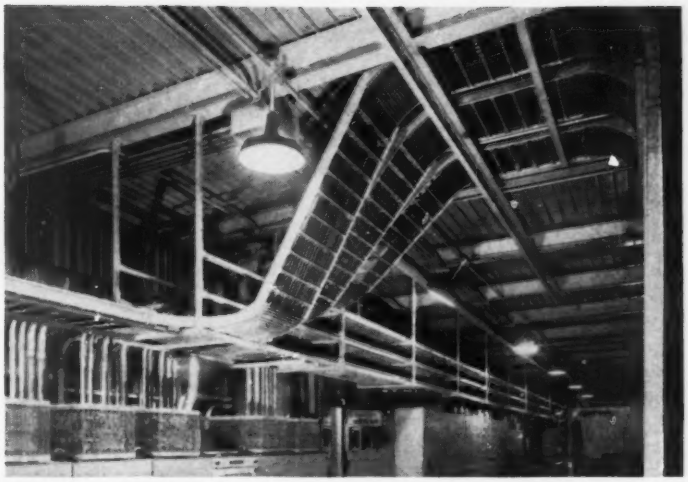
Fair should steer a course favorable to the engineer in private practice. According to Brig. Gen. William Whipple Jr., the Fair's chief engineer, this will be so. Though it will mean an additional supervisory burden for his small staff, the General stands strongly for the use of consulting engineers and has no intention of building up a huge bureau. The complete details on the World's Fair, to date, appear in Eastern Editor Marjorie Oden's "Field Notes," page 158.

It was in the early '30s, as our older readers will recall, that a magazine called *Ballyhoo* appeared on the newsstands and had a short but happy life. Each copy of its first issue was wrapped in cellophane and carried the blurb, "Read a Fresh Magazine." The occasion for this was the discovery by the tobacco companies that cigarette packages could be sealed in cellophane, thereby maintaining the freshness of the tobacco a few weeks longer. *Ballyhoo* magazine had simply burlesqued their advertising campaigns. It took nearly 30 years for us to catch up with *Ballyhoo*, but now we offer you CONSULTING ENGINEER magazine wrapped in "cellophane." Actually, it is not cellophane but a polyethylene film of more recent invention. Our purpose is much the same as *Ballyhoo's*. We want you to get a fresh magazine, unruffled by the mails. Our tests indicate that wrapped in this new plastic, each copy will stand up to the buffeting of the post office people and reach you in the same fresh condition that it left our printers. Our new wrapping started with the current issue. So far as we have been able to determine, CONSULTING ENGINEER is the first business magazine to go to this new wrapper — even if we are a whole generation behind *Ballyhoo*. We hope that our readers will find the magazine arriving in better condition than ever, and would appreciate comments on our new mailing package. ▲▲

how INLAND STEEL uses GLOBE INTERCHANGEABLE TRAYS to support cables in their Indiana Harbor Plant



★ Engineered for Uniform Design and Easy Installation
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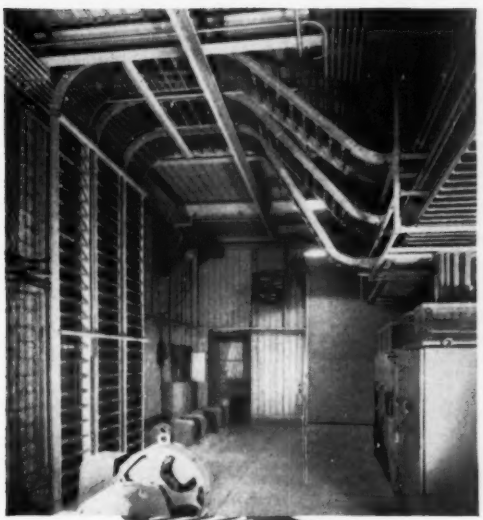

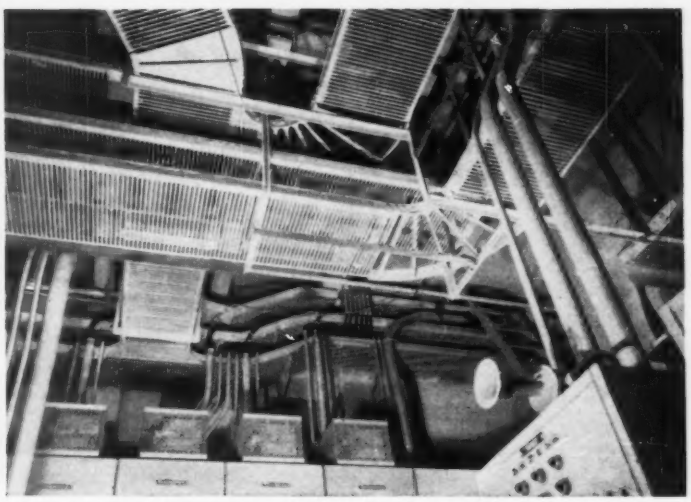

Globe's two types of cable trays, one a ladder type and the other a basket type, to support cables, wiring and tubing have become increasingly popular because they can be used INTERCHANGEABLY at any given location depending on the type and weight of the cables to be suspended. The advantages of each type tray can be used to the fullest. Globetray, the ladder type, is intended for use where festooning is not a problem, while Cable-Strut, the basket type, is used for the support of communication wire, instrument tubing and control cables in automation applications.

These two cable trays have been thoroughly field tested in hundreds of large industrial installations, in new plant construction, in power plants and for power distribution in all types of manufacturing processes. Send for FREE catalog giving full information and installation techniques.

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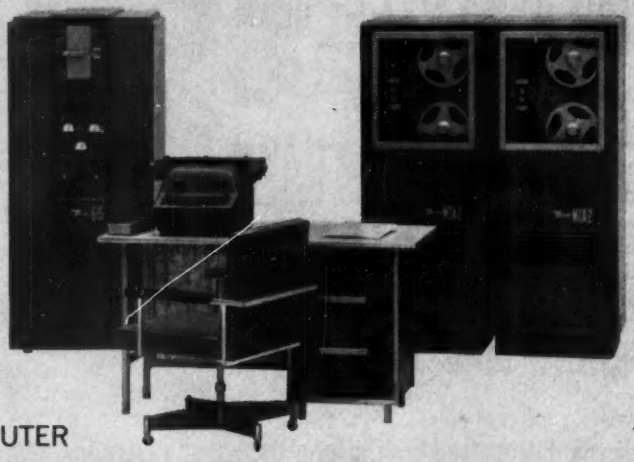

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PROBLEM: $$I = \frac{E}{\sqrt{R^2 + (6.2832\,FL - 1/6.2832\,FC)^2}}$$

(For values of R,F & L as specified. For values of E ranging from 100 to 300 in increments of 50. For values of C ranging from .00002 to .000021 in increments of .0000001)

COMPLETE ALGO PROGRAM:

```
BEGIN ⑤
R = 10 ⑤
F = 60 ⑤
L = ₀2 ⑤
FOR E = 100(50)300 BEGIN ⑤
FOR C = ₀00002(₀0000001)₀000021 BEGIN ⑤
I = E/SQRT(R ↑ 2 + (6₀2832 * F * L — (1/(6₀2832 * F * C))) ↑ 2) ⑤
PRINT (FL) = E ⑤
PRINT (FL) = C ⑤
PRINT (FL) = I ⑤
```

Write on your letterhead for the self-teaching ALGO manual.

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. . . for tight corner settings!

■ This new copper yoke now lets you set the meter in basement or utility room corners where the piping is too close to the walls to install regular yokes. Meters can be properly set at a convenient height for easy reading and servicing. The sturdy design rigidly supports the house piping and protects the meter from piping stresses.

Installation is fast, too! Convenient union connections for installing yoke in steel pipe or compression couplings for installing in new or existing copper pipe. No other fittings are needed.

Compression couplings with locking nut positively insure continuous electrical bonding of the piping.

two models available:

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- for ¾" steel pipe
  H-14811 — Copper Meter Yoke with ¾" inside I.P. thread union connections on inlet and outlet.
- for ¾" copper pipe
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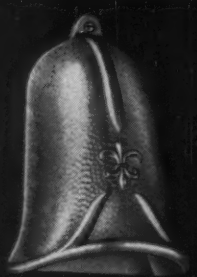
Killark explosion-proof light fixtures provide approved protection for Class 1, Groups C and D; Class 2, Groups E, F, G installations. Special inner reflector plays important part in excellent lighting efficiency. Pendant, ceiling, bracket and flush mountings. Shock-proof, heat-resistant annealed globe. 60 to 500 watt.

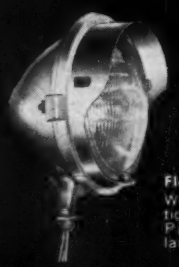
DUST-TIGHT

Approved light fixtures for use in Class 2, Groups E, F, G hazardous locations. Vertical design keeps dust from accumulating, close fitting parts keep it from entering fixture. Coolest burning dust-tight lights mean added safety. 100 and 150-300 watt sizes.

SPECIAL LOCATIONS

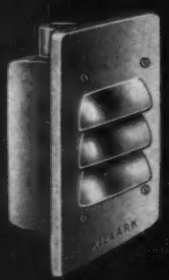


Conch light
Many applications—indoors or outdoors. Attractive fleur-de-lis design. With or without switch.

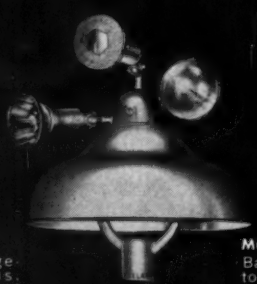


Flood light
Weather proof in any position. Styles for PAR-56 and PAR-64 sealed beam lamps.

Sealed beam light
Variety of single or cluster styles, adjustable mountings. Sealed against weather. PAR-38 and R-40 lamp styles.



Louver light
For steps, passageways, small signs. Easily installed and serviced.



Mushroom island light
Basic island light, plus one to five sealed beam spot lights, as required. Ideal for service stations, parking lots, etc.

Dekorative light
Gives added beauty. Pendant or ceiling mounting, frosted or clear globe. 60-100 and 150 watt lamps.

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ACCESSORIES
Write for the Killark lighting catalogs.

Wherever protected illumination is needed...

KILLARK LIGHT FIXTURES SERVE WITH DEPENDABILITY

A complete line of industrial and commercial lighting fixtures allows Killark to serve all types of installations with proper protected lighting. The Killark ability to supply exact needs means maximum safety, convenience, and efficiency—for both hazardous and non-hazardous locations.

All Killark fixtures are cast from aluminum to provide important extra advantages. Installed inside or outdoors, they remain permanently rust-proof. They give outstanding service in many areas where corrosion is a problem. Aluminum also dissipates heat at a much faster rate, and is safer because it's non-sparking.

Simplicity of design is still another reason for the superior performance of Killark light fixtures. Most styles have interchangeable parts to allow quick, inexpensive changes in mounting method, wattage capacity, type of globe, or reflector. Relamping can be done easily without tools.

Your Killark dealer can supply these fine light fixtures promptly—from his stock or one of the nineteen Killark warehouses in the United States and Canada.

Killark light fixtures are U.L. and C.S.A. approved.

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Here's a completely new line of Airfoil Bladed Fans from American-Standard Industrial Division with an exclusive radial rim wheel design that substantially lowers air velocity through the blast area of the wheel. This new design, plus airfoil blading, reduces turbulence and results in unusually quiet fan operation. Exceeding 90% in mechanical efficiency, American-Standard* Airfoil Fans are ideal for both general ventilation and industrial process applications. And every one carries the AMCA certified rating seal. Get all the facts. Send for Bulletin A-1103 today. American-Standard Industrial Division, Detroit 32, Michigan. In Canada: American-Standard Products (Canada) Limited, Toronto, Ontario. *AMCA Certified Ratings*

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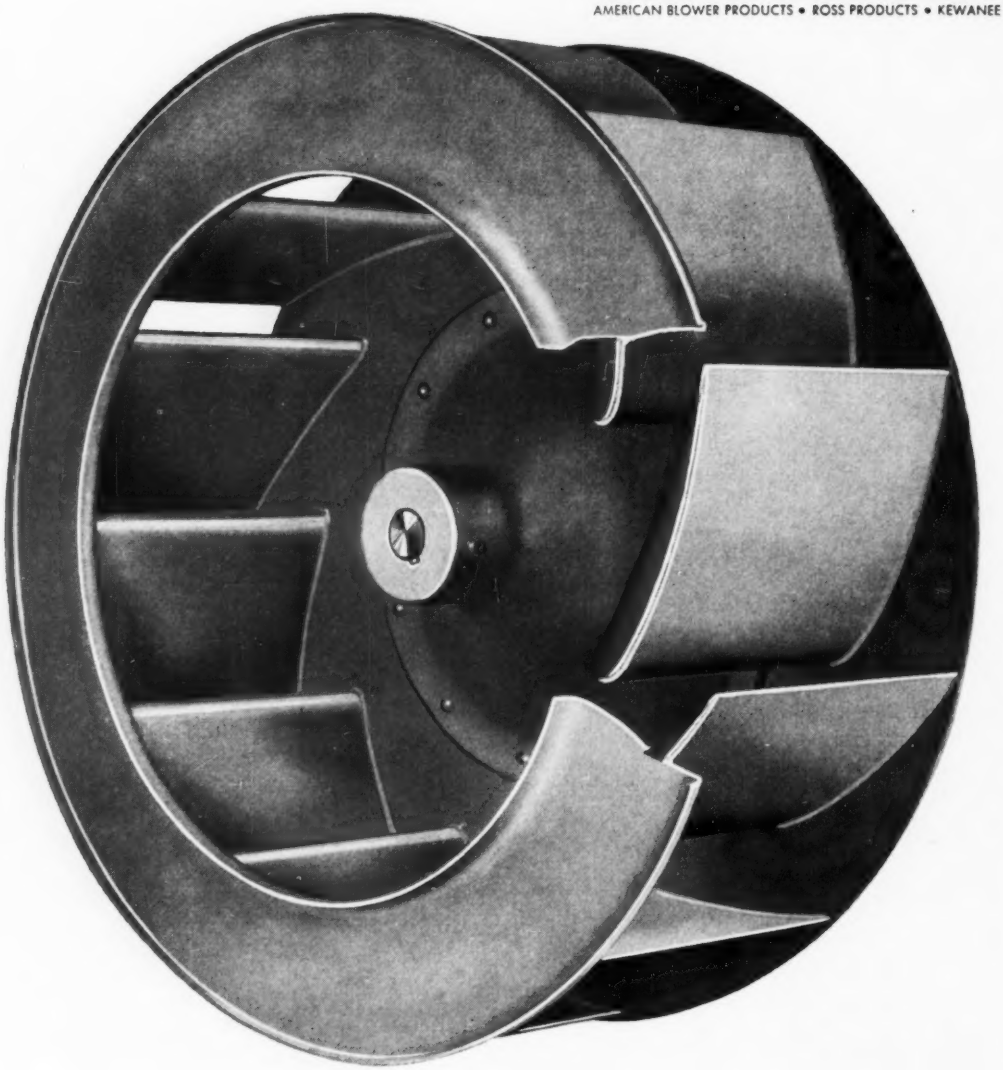


Presenting . . .

Our Authors

Harry F. Brown began his railroad carrer in 1910, just three years after graduating from the Sheffield Scientific School of Yale University. Until 1952, he was with the New York, New Haven & Hartford R.R. Co., responsible for all electrical engineering in connection with power, including purchase power contracts, traction, maintenance, and all fixed installations. Brown then joined Westinghouse Electric International Co. on a consulting basis to study the problems of railroad electrification in countries all over the world. Since 1953, he has been associated with the consulting firm of Gibbs & Hill, Inc. as a railroad specialist.

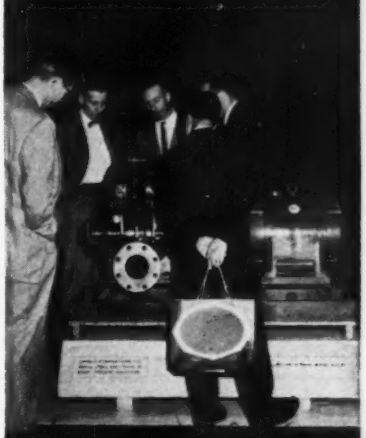
A member of many technical organizations, Brown has had his longest association with the American Institute of Electrical Engineers. He is a fellow and life member of that organization. He has written many technical papers, and his views on railroad electrification (page 109) are based on many years of experience.

Donald E. McLeod is the chief mechanical engineer of West America Engineering Company, Inc. No newcomer to the pages of CONSULTING ENGINEER (see September 1959), McLeod again takes up the subject of heating coils – this time dealing with the problems of systems and selection on page 100. His experience in the air conditioning field began in 1937, and, except for a brief period of activity in the field of machine design during World War II, has continued ever since.

McLeod is a graduate of Lafayette College in Easton, Pennsylvania, where he received a B.S. in Civil Engineering in 1931. He received his professional registration as a mechanical engineer in California in 1947, and is a member of the American Society of Heating, Refrigerating and Air Conditioning Engineers. He has held several offices on chapter and regional levels with that organization. Currently he is in responsible charge of mechanical design for a variety of building projects.

WHAT'S BUILDING UP IN

PUMPS AND COMPRESSORS?



Often regarded as the "heart" of a system, pumps and compressors merit frequent re-evaluation to determine that you are using the right machine for a specific application.

Listening to the "heartbeat" of pumps and compressors can best be done at the Power Show, where you can ask questions, investigate and compare, get first hand answers from the manufacturers themselves. There you'll also see a broad line of other power and allied equipment.

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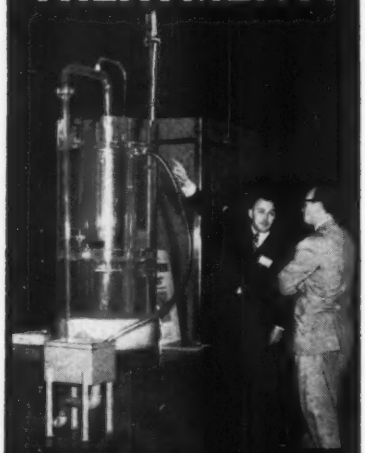

Is good boiler housekeeping in your plant beset by sludge, scale and corrosion? Are these enemies of efficiency increasing downtime and maintenance costs, fighting company profits and your own career?

The Power Show can help you find better ways to fight back. It can help you keep your company's profits growing and your own job on the upgrade by keeping you up-to-date on water softeners, demineralizers, dealkilizers, filters, deaerating heaters and clarifiers — PLUS a broad line of other power and allied equipment.

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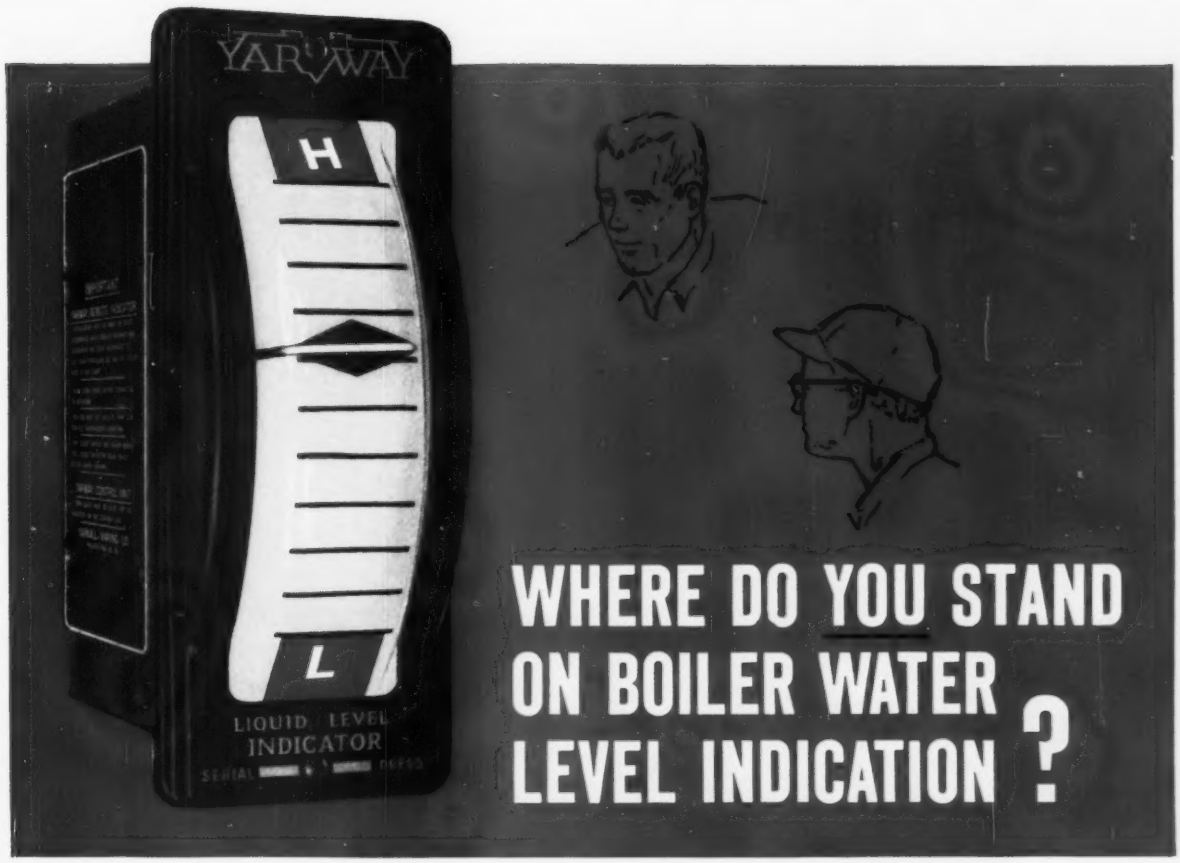
Denes Gellert is well qualified to speak on post-war consulting engineering in Hungary — page 116. Before taking refuge in the U. S., following the 1956 uprising, he had spent 7 years as directing design engineer in the Budapest Planning Bureau. Until 1949, he had his own consulting practice in architectural engineering.

Gellert is an honor graduate of the Budapest Lutheran Gymnasium, a Diplomate Civil Engineer (1942) of the Royal Hungarian Joseph Palatine Technical University, and comes from a family of professional engineers. Since coming to the United States, he has worked for several consulting firms, is active in engineering societies, and has pursued his interest in prefabrication of buildings.

Wayman C. Wing heads his own consulting firm in New York City. In his article on page 88 he introduces some thoughts on the relationship between contractors and designers which, though not untried, are most certainly uncommon.

Wing has worked on many types of projects, including hotels in Australia, San Francisco, and Bermuda. He is widely experienced in structural design, particularly in the field of flat plate, multi-story reinforced concrete. His engineering degrees are in civil engineering — a B.S. from the University of Wyoming and an M.S. from Stanford. He was with the USAF during World War II for 3½ years. A member of the American Society of Civil Engineers and the American Concrete Institute, Wing holds Professional registration in both New York and California.

Marvin A. Salzenstein is a native of Chicago who earned his B.S. in Mechanical Engineering from Illinois Institute of Technology in 1951. He joined McCrone Associates in 1957 and has worked on industrial performance standards - - see page 104 — in the Chicago area as well as in New York City; Minneapolis; and Huntington, West Virginia. Since May of 1960 he has been a consultant to the Cook County Zoning Administrator's office. Salzenstein is an active member of the American Society of Mechanical Engineers, the Air Pollution Control Association, the National Fire Protection Association, and the American Gas Association.



Yarway Remote Indicators have "wide angle" visibility from multiple vantage points

Yarway Remote Liquid Level Indicators bring distant, often hard-to-see boiler level readings right down to eye level on the panel board or other convenient location.

No matter where you stand—at any point in a 180° arc, and from a considerable distance—the brilliant new wide vision dial makes viewing and reading easy.

Accurate readings because Indicator is operated by boiler water itself

Remote readings of levels in boilers (also feed water heaters and other heat exchangers) are instant and accurate because indicator *operating mechanism* is actuated by the varying head of the liquid itself, yet the *pointer mechanism* is never under pressure.

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Under A.S.M.E. Boiler Code Committee ruling in Case #1155, two independent remote level indicators of compensated manometric type may be used as primary indicating elements instead of one of the two gage glasses required for boiler pressures 900 psi and above. When both indicators are in operation, one gage glass may be shut off but shall be maintained in serviceable condition.

Yarway Remote Liquid Level Indicators conform to this ruling and are used widely for primary boiler water level indication in plants operating at 900 psi and above.

All Yarway Indicators for service over 700 psi are temperature-compensated; pressure compensation available when desired. Use of controlled-temperature column on constant head chamber fully protects against system upsets.

If you would like a reprint of this Boiler Code ruling, just ask for Case #1155 reprint.

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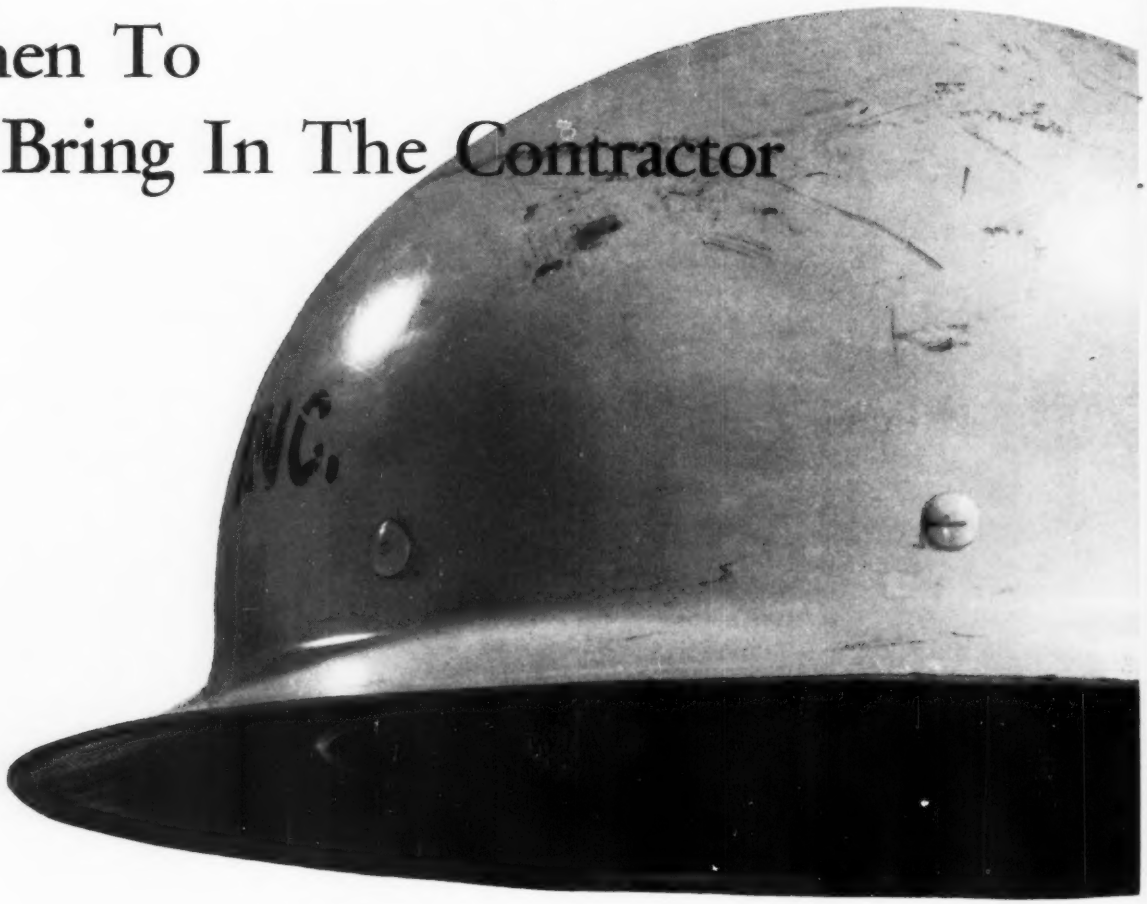
When To Bring In The Contractor



GOOD ENGINEERS and architects, by nature and training, are primarily concerned with creative achievement. But once a project has been conceived and preliminary details established, they must work together to fulfill the owner's requirements as economically and expeditiously as possible.

CE exclusive

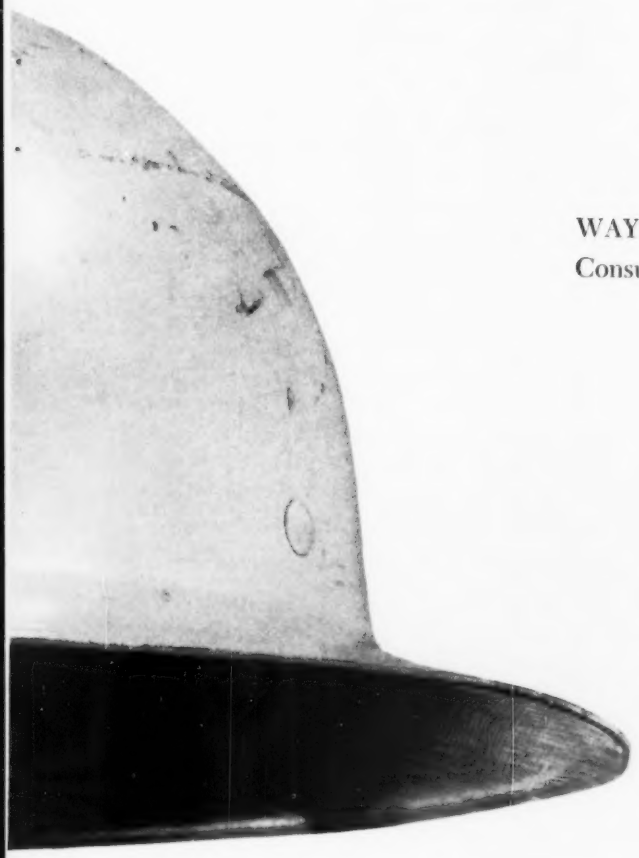
The owner has in mind an esthetic structure in which he can take pride. At the same time, being a practical businessman, he also envisions a good return for his money from a building that will serve him functionally. The architect knows the owner's requirements and plans the building accordingly. However, being an artist as well as a professional, he also envisions a creation which will win him recognition – sometimes to the detriment of economy and practicality.

The engineer often feels that a structure is not a structure unless it is as sound as the pyramids and practically bombproof. On mechanical work, there is sometimes cause for feeling that the building was designed primarily to house machinery and equipment instead of rental and functional space. However, the good engineer designs for minimum cost without sacrificing his engineering integrity. He is completely familiar with what the architect and the owner are trying to achieve and offers his advice and judgment in the form of a sound design.

As a team, the owner, the architect, and the engineer must compromise some of their own personal aspirations before a project can succeed. The architect must limit his creative ideas to practically attainable goals, the engineer must seek new and progressive solutions, not always relying on the old reliable ones, and the owner must realize that the architect and engineer should be allowed a fair profit if they are to work at their highest professional level.

The Contractor's Role

But what about the contractor? The contractor is generally selected through competitive bidding



WAYMAN C. WING
Consulting Engineer

after completion of the working drawings and specifications. Even though he may be well qualified, he is forced to assume a position opposite that of the owner, the architect, and the engineer. This is not unusual, and, in fact, works successfully on most construction projects. However, it requires a nearly perfect set of plans and specifications – and the time required to make them so. But, there are many situations where time is an important factor in the owner's financing plans. To delay construction until an ideal set of drawings and specifications can be made may be costly and sometimes even forces the owner to refinance. The inclusion of the contractor in the original planning may mean that construction can begin months earlier – with final project cost greatly reduced.

The Fixed Fee with Guaranteed Upset Price

The early selection of a contractor immediately suggests the fixed fee with a guaranteed upset price form of contract. This form of contract is in general use. It is sometimes preferred by owners who are contemplating a fine building for their own occupancy, as well as when the owner must begin construction before the completion of the working drawings. The contractor, sitting in as a member of the design team, can assist in making comparative costs studies of different types of foundations; structural frames; floor, wall, and ceiling finishes; facade treatments; lighting; mechanical installations such as air conditioning and heating systems; and all the electrical distribution layouts. The contractor would undoubtedly have a wealth of past experience regarding cost and construction methods which, when incorporated in the design team's thinking, could result in the most building for the least dollar invested.

With the contractor acting as a part of the design team, he can set up an estimated budget and, upon the owner's approval, start excavation and foundation work long before anything but preliminary drawings are available. During the period when final plans and specifications are being developed, voluminous revisions of details may be made, even though the basic plan will not change. These revisions will occur because cost cutting can be carried on throughout the construction period. The contractor is in a position to take over much of the buying and can often get prices better than those in the original estimates. With signed contracts in sight, many suppliers and subcontractors will compete with each other more strenuously. Of course, the engineers and architects usually must revise and adjust many of their details in order to accommodate any substituted material or to fit the selected subcontractor's method of operation. These items are studied by all the members of the design team before a decision is made

for their acceptance and incorporation into the final working drawings.

When the plans and specifications are developed to the point where they are reasonably explicit, the contractor can make a final cost estimate of the work. When this estimate is complete and all parties agree that the price is fair and reasonable, the contractor generally will guarantee this estimated cost plus his previously agreed fixed fee. This fixed fee is paid for his services — it should remain unchanged throughout the job.

Contractor Oriented Design

There have been many times when this or a similar arrangement with the contractor has proved to be advantageous. The new 300-room Hilton Inn, located at San Francisco's International Airport is an excellent example. The final cost was 5 percent under the contractor's original budget estimate and approximately 20 percent under his guaranteed upset price. Even though Cahill Brothers, Inc., the contractors, were on one coast and William B. Tabler, the architect, and Seelye Stevenson Value & Knecht and Cosentini Associates, the engineers, on the other, the team worked very closely throughout the preparation of working drawings. All of the architectural, structural, and mechanical details were designed with quality and economy in mind by everyone involved.

For economy, a wood frame type of structure was used on this project. However, at the suggestion of the contractor, a 2-in. concrete floor slab was poured in special floor lath instead of the normal wood sheathing over the floor joists. The concrete floor slab provided a good sound and fire barrier between the floors, at a cost only slightly more than that of wood sheathing with other sound reduction materials.

This project cost approximately $2 million — less than $20 per square foot. It included a very unusual administration building constructed of structural steel, concrete, and wood, featuring folded shapes for the low roofs, a swimming pool, and site work, as well as almost $40,000 worth of furniture and fixtures.

On the addition to the Brown Palace Hotel in Denver, Colorado, the contract was not a completely negotiated type from the very beginning of the design drawings. However, the owner, the architect, and the engineer were in constant liaison with each other and the contractor, N. G. Petry Construction Company. The result was a very unusual 22-story tower structure that cost less than $22 per square foot. After the team investigated local conditions, it was learned from the contractor that drilled-in caissons were commonly used in this area. Because of the soil conditions they often could be installed for practically the same price as large spread footings. Naturally, the engineers chose to use these caissons, carrying them to solid bedrock to support the tower. The lower one- and two-story portions of the building were floated on the fairly good sand and gravel which existed just below the basement slabs. Many of the basic architectural, mechanical, and structural items were designed with the contractor's experience in local costs as the guiding criterion.

The fixed fee with a guaranteed upset price also proved successful during the development of the final working drawings and the construction of the Statler-Hilton Hotel in Hartford, Connecticut. The George A. Fuller Company made many suggestions for cutting the cost of this tight budget building. They report that even though about 50 percent of their entire volume of work in the past 77 years of continuous building has been on some form of lump sum contract, they are finding that the fixed fee with a guaranteed upset price arrangement is gaining in popularity.

The Pros and Cons

From these examples, it is evident that there are many situations where it is advantageous to bring the contractor in on the project planning as early as possible. However, many clients, architects, and engineers feel that the development of design, working drawings, and specifications is best performed without the contractor. The main reason, of course, is to guarantee the client the price advantage of competitive bidding between contractors. Also, many engineers and architects feel that professionally they should not be too closely allied with the contractor. However, there are probably many projects where a contractor could be retained, in the same manner as architects and engineers, to get the benefit of his experience in construction methods and costs. Most engineers and architects find it difficult to keep up to date on this aspect of design, whereas it is the contractor's primary concern. It is true that contractors sometimes offer conflicting cost data, but the engineer and architect would consult a contractor anyway and draw their own conclusions from the information obtained from him.

This maximum team effort requires substantially more time from all the members. This additional effort should be compensated by a fair fee from the owner. The net savings in construction costs to the owner, which results from this additional effort, is considerably greater than the false saving that comes with the lower competitive cut-rate or speculative type of service. The fixed fee with a guaranteed upset price can often result in better construction at lower cost to the owner. ▲▲

PR

RICHARD B. ESPEY
Public Relations Counselor

"PUBLIC RELATIONS is of little interest to us, for ninety percent of our business comes from clients we have previously served." This attitude toward public relations is not at all uncommon among consulting engineers, but the fact remains that these two words describe something every consulting engineer has whether he thinks he needs it or not. He may call it something else, or he may ignore it, but it is always close by, always affecting him and his practice – favorably or unfavorably.

The good work a consultant does for his clients is certainly the most vital factor in public relations, but it is not enough. Good work must be supported by a planned program of public relations if the consultant organization is to grow and prosper, and continue to serve those satisfied former clients.

The consultant as a practitioner of a profession frequently questions the propriety of public relations. All too often, the term is taken to mean expensive drum beating on a national scale or noisy spectacular activities that tear down any dignity a firm may have worked to achieve. Actually, true public relations for the consulting engineer means getting known, liked, trusted, respected, and preferred; while developing professional dignity.

The Horrible Example

Many of the elements in a basic public relations program seem obvious when put down in print. These simple items so often neglected include the voice on the telephone, the prompt response to inquiries, the clearly written letter or report. For example, a Chicago consulting engineer recently received an inquiry from a potential client in Houston. Though the engineer has a national reputation, this particular prospect knew little about him and his firm's work. Three weeks later the prospective client received a letter in response to his inquiry. It was typed on a machine which should have been retired long ago. The girl who typed it was either having a bad day or must be clasified as a generally incompetent typist. The wording of the letter was careless, ambiguous, and tactless – it contained a reference to Texas that the consultant thought was humorous but the Texan thought boorish.

The engineer who lost out is an expert in his field and has an attractive and convincing personality. He would surely have been given the assignment if the contact had been in person. But he needs a new typewriter, a new stenographer, a new

letterhead, and a little guidance in the technique of business letter writing if he wants to deal with clients by mail.

Where P.R. Begins

Is this a part of public relations? It is. This is where you start. You can go on to a program involving published articles, news stories, awards, brochures, sales letters, and visual presentations. In fact, if a man has enough on the ball, an expertly handled public relations program can make it possible for him to become a respected public figure, even an international celebrity. But such a man must first be worthy and capable. Public relations activity is not witchcraft; it cannot make something out of nothing. It merely points out the deserving person to the public.

A Practical Program

For most consultants a public relations program should include:

¶ A newsletter or other regular communique to prospective clients.

¶ A brochure descriptive of the consultant's services. If many fields are covered, there may be separate brochures for each.

¶ Articles written by principals of the consultant organization for publication in business or technical magazines.

¶ Properly placed professional cards.

¶ Talks presented before professional and prospective client groups.

True, if you did all this, you would not have any time for your engineering work. But you cannot expect to do it all in a day, a month, or even a year. If you were to start with just the first item or the first two and get those under way, the others would come easily at their proper time.

The immediate problem is the determination of the direction you want your organization to take. Many middle-size and large consultant organizations have grown up, without direction or planning, from one-man companies. Business is good but it is unpredictable, and the firm is weakest in fields in which it would like to be growing fastest. There are unprofitable clients and profitable clients. You would like more of the latter. Who are these clients you want to serve? Can they be classified? Is it as simple as concentrating on owners and avoiding architects? Is the whole trend of business in your area changing? Must you get out of government work and build up industrial clients? This you must decide. You must pick your client group and your fields of activity. Your public relations program will concentrate on them.

Good current clients come first. In this group will be all the companies you have served in the past five years, and those you are presently serving, who fit into your plans for your firm.

What can you do in public relations to stimulate more business from these people who already know how good you are? One simple way, often neglected, is to write them a letter – a friendly letter that asks about them and their business and tells briefly what advances your own organization has made. Old friends can forget; the friendly letter is the quickest, simplest way to avoid that.

The Newsletter Idea

Many consultant organizations are making good use of the newsletter idea. This is printed and is not so personal as a letter; but it can go to new prospects as well as past clients, and it is a practical way to reach a lot of people regularly. Most newsletters are four-page affairs, printed in one or two colors. They provide a forum for you to talk about the fields you serve and the way you serve them. They provide space for you to tell about all the services you offer, some of which may have been overlooked lately. Even an old client may not know about some of your talents. The newsletter also provides a place for case history reports of some recent assignments. Usually the client whose job is described is not only willing to be identified, he will help with the story and perhaps even broaden distribution of that issue by sending it to his own customers.

To do an effective public relations job, the newsletter must be sent regularly and persistently. It is better to publish and mail six or even three issues a year on a regular basis than to start out ambitiously on a monthly basis and then find you do not have enough material or time to continue publishing on your original schedule.

Whose job is the newsletter? While larger firms may have someone assigned full or part time to public relations and publicity work, the problem is difficult for the smaller firm. An advertising agency is not likely to be interested unless you have other work, and a fat budget. A good layout artist with a printer contact can provide a lot of help so that even an inexperienced man can do a passable job. If an outside public relations counsel is retained, he could be assigned the preparation and distribution of the newsletter.

The spirit and feeling in the newsletter must be compatible with that of the organization; it must be representative of the way you think and work as an engineer. It ought to be written largely by the principals of your organization. If the writing needs some polish, it should be polished skillfully, not recut, reshaped, and reset. A good editor can clean up a piece while retaining the style and emphasizing its better aspects. The newsletter, then,

is an effective and professionally acceptable way to kindle the interest of prospective clients.

The Sales Brochure

The brochure describing your service and presenting your professional experience record is a standard item. Yet, many of the most successful consultant firms have nothing more than unattractive, mimeographed sheets listing client services, reluctantly distributed on request. This proves that it is possible to be successful the hard way. This approach is perfectly suited to any firm that has more business than it needs, an international reputation for excellence, and no desire to outlive its more distinguished partners.

Most firms do not fit those specifications, so most firms need good brochures. Few have them. One thinks of a good engineering firm as being progressive, alert, cheerful, informed, and easy to do business with. Yet, consulting firms usually introduce themselves through a brochure written in stilted, awkward sentences, set in poorly selected type, and illustrated with drawings and photographs that would disgrace a high school annual. There are some extremely effective exceptions, but they are all too rare.

If you want to revise your present brochure or publish a new one, an initial move is to take a look at the exceptional publications of other engineering firms. Some of the best brochures are beautifully printed and elaborately bound. They are expensive productions costing much more than most firms can spend. If you look at enough of these brochures, however, you will get ideas that can be used, much less expensively, in your own firm's presentation.

The brochure ought to cost just as much as you can afford. The lowest prices in design, art, and printing can turn out to be the most costly. The brochure is an ambassador, a salesman in print. You will very likely use it for at least three or four years. A low initial cost does not assure a bargain in the long run.

The effective brochure tells a straightforward story, following the same pattern that you use when you explain your services to a prospective client who has never heard of you or your firm. It will tell who you are, who you serve, and how you serve them. Your brochure must be so written that it fully informs the many potential clients who never heard of a consulting engineer, yet does not insult the intelligence of an old client fully familiar with the profession.

Should the brochure list present and past clients, projects handled, and territories covered? Usually, yes, so long as nothing is said that would infringe on confidential client relationships. The work you have done in the past and those whom you have served are always your best references.

What about the actual physical job of putting together the brochure? This can best be done by working with a public relations counsel, an advertising agency, or some printer-artist-layout man combination. Look at their samples and satisfy yourself as to their competence before you consider hiring them.

Incidentally, the printer will want to know the run before he starts publishing – in fact, he will want to know before he quotes a price. So you must know how broadly you want to distribute and how long you expect this edition to last. Then you can say how many you want printed. You may, for example, want to make a mailing to your list in advance of the brochure, asking for inquiries and then sending the brochure only on request. You may decide that everyone on the prospect list ought to get it, inquiry or not.

If you have a newsletter, you can announce your brochure in it. The brochure should also be memtioned in any professional cards you carry in directories or in busines magazines. The brochure may also be the subject of a publicity release directed to editors of business publications in your field.

Intangible Values

There are intangible values associated with the preparation of a brochure, particularly if it is the first one. The planning involved forces principals to take a look at the firm and its work from an entirely different point of view. They usually learn a great deal.

If this new perspective is stimulating, the firm is on the right road. If there are fields of activity that are interesting and profitable but all too seldom seen on your list of projects, or if there are a lot of projects of a type you would rather forget, then it probably is time to carefully analyze your management.

Planning a public relations program is just as logical as engineering design, though the tasks involved may seem momentarily strange. Writing and the graphic arts are practical matters, as practical as designing a bridge, an air conditioning system, or a power plant.

A public relations program will not change your business overnight, but proper distribution of a newsletter and a brochure will develop inquiries and help greatly to bring about improved client relations.

You will still have to do superior engineering, but you will have additional forces working for you. You will know the direction you want to go, and so will your prospective clients. Before long, you will be going in that direction. ▲▲

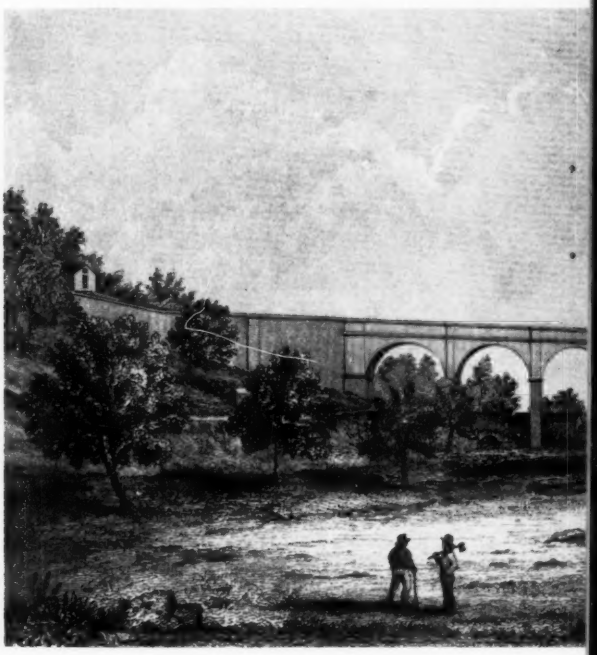
ILLUSTRATIONS OF THE CROTON AQUEDUCT.

BY

F. B. Tower,

OF THE

ENGINEER DEPARTMENT.

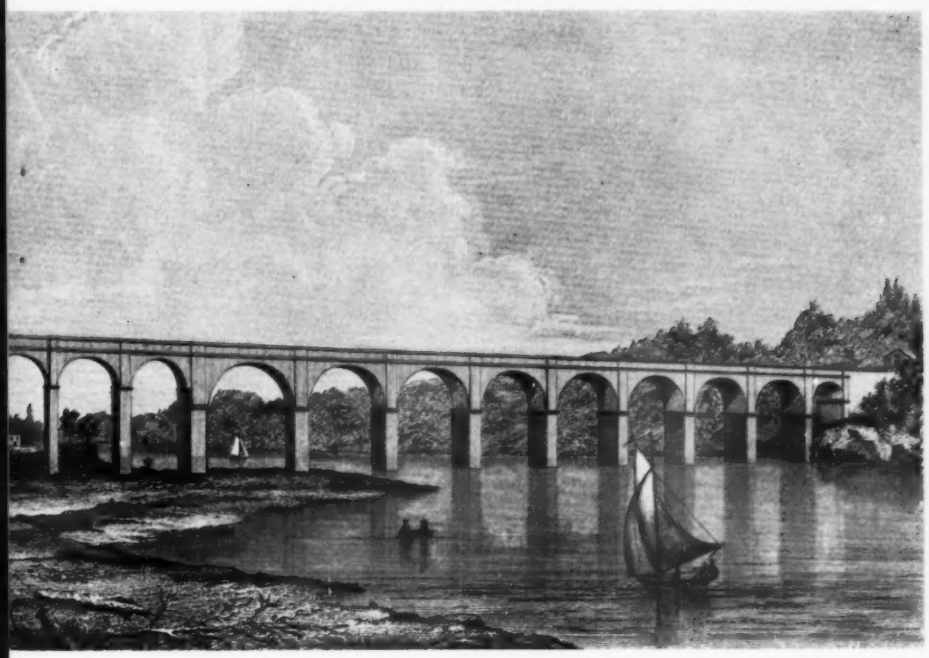


THROUGH THE 18th Century, New York City's water-supply consisted of a few dozen widely scattered wells, most of them producing unpleasant, and often impure, water. In 1799, the Manhattan Company was organized by Aaron Burr, for the express purpose of "providing the City of New York with an adequate supply of pure and wholesome water." The new company's water supply was adequate – for a while – but it was seldom palatable. This was nothing new, for in the nearly 200 years of the city's existence, suitable water for drinking, washing, and fire-fighting had always been a problem. This problem had grown so acute by the beginning of the 19th Century that the Common Council was continually faced with resolutions to curb drunkenness, because the only way many of the natives would take the water was with a little brandy. (Reputable doctors had declared that dilution with alcohol not only made the New York water taste better, but also destroyed many of the harmful impurities it contained.)

CE exclusive

Other problems occasioned by the lack of fresh water were still more serious. Epidemics of plague,

A 115-ft column of water, called the Harlem Jet, marked the Harlem River crossing before the High Bridge.



The High Bridge over Harlem River was the most impressive section of the Aqueduct. It was originally planned to use the bridge for a road as well as the Aqueduct, but it was built with only a foot path across it. No one ever tried to explain why they had not gone ahead with the perfectly reasonable plan for a roadway.

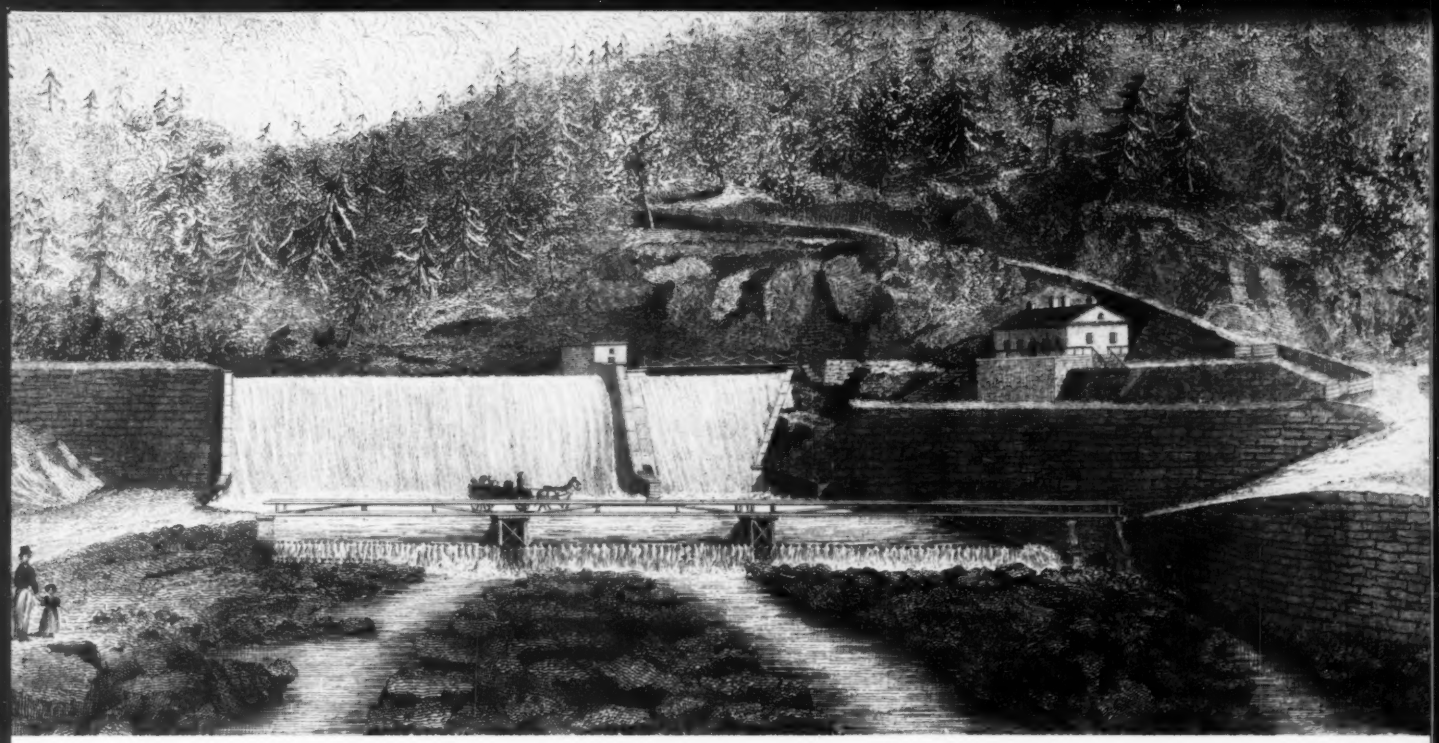
cholera, and yellow fever killed hundreds every year. Fires that were not immediately controlled often swept through entire blocks of buildings, destroying homes and shops, putting many people out of work, and occasionally bankrupting insurance companies. The streams, the streets, and the waterfront were so littered with filth and sewage that foreigners were warned to avoid New York. The Manhattan Company seemed for a while to make some improvement, but it soon lapsed into the political ease of doing nothing but pumping water, with little regard for quantity or quality.

Many plans, several of them practical, were suggested to the city for alleviating the water problem. But the Common Council's failure to agree on any one plan, and political pressure from the Manhattan Company, prevented definite action. New York City's water got worse and worse.

The Croton River Plan

Finally, on March 4, 1834, the Council adopted the recommendations of a special Water Commission which had been appointed to decide on a suitable method for providing New York with water. The Commission proposed to "bring the water of the Croton River to the City of New York by a closed aqueduct of masonry . . . The cost of the work, as estimated by the Water Commissioners, (including

The frontispiece of Tower's book showed New Yorkers enjoying one of the many new fountains in downtown Manhattan. The city installed dozens of fountains in a display of its new-found wealth.



The view from below the Croton Dam. The earthen embankment on the left was constructed with imperfect knowledge of the stream's variation. While being constructed, it collapsed after a rainstorm and 3 persons were drowned.

the cost of the city mains and conduits installed beneath the streets) was $5,412,336.72."

The plan was presented to the city voters in April of 1835, and passed by a 3 to 1 margin. Most of the dissenting votes were from the uptown districts, where water was neither so badly polluted nor in such short supply.

The first chief engineer on the project was a former Army officer, David Bates Douglas, who designed the Morris Canal joining the Delaware River to New York harbor. He was succeeded in October 1836 by John B. Jervis, later an outstanding railway engineer. Jervis continued as chief engineer until completion of the project.

The first description of the Croton Aqueduct was made by F. B. Tower, an employee of the Engineer Department, who, in 1843, published a text to accompany his own sketches of the waterway. From loyalty to his employers, or perhaps deference to the gentility of his readers, Tower made little reference to the political and personnel difficulties encountered in building the Aqueduct. He refers specifically to only one — the biggest one — the squabble over the Harlem River High Bridge.

High Bridge Over the Harlem

The outstanding section of the Croton Aqueduct, from every viewpoint, was that crossing the Harlem River. When Tower published his book, the High Bridge had not yet been built. A temporary cast iron inverted siphon had been run across the river to carry the water until the bridge could be completed to carry the Aqueduct.

The long and involved controversy over the proper method of crossing the Harlem River was apparently settled by the Water Commission, shortly after the authorization of the Aqueduct. They had decided on a low-level bridge which would carry the water over the river on an 80-ft span. The top of the arch would be 50 feet above normal high water level, since this was thought to be more than adequate for any ships that might ever navigate the Harlem River. Work had already begun on the Low Bridge when "a law was passed by the Legislature of the State requiring, instead of this, a structure the arches of which should be (over the channel of the river) at least 80 feet span and having a distance of 100 feet from the level of high water to the underside of the crown; or to go under the river by a structure which should not rise above the bed, and that would leave the present channel of the river unobstructed."

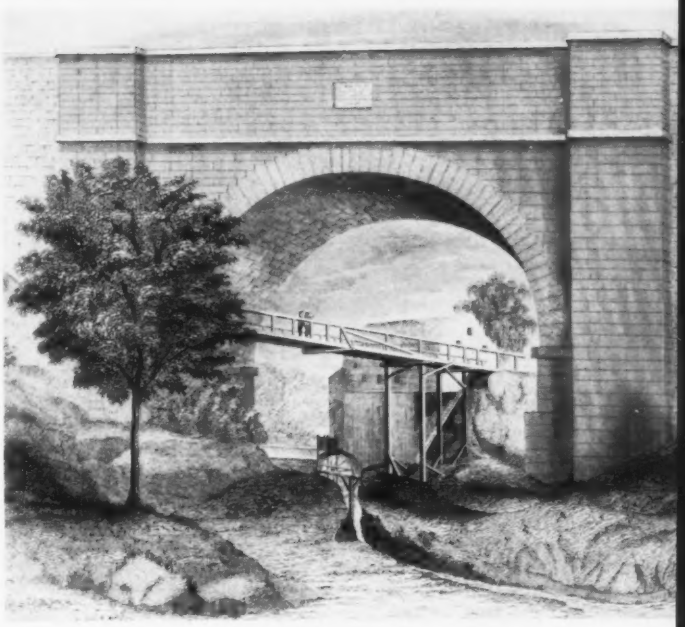
The Council decided upon the tunnel, and started to have plans drawn up. Then they decided that the imperfect knowledge of the composition and structure of the river bed, and the uncertainty in the estimates of cost and time required for the tunnel would make it too much of a gamble. So they were left with the High Bridge. It was not a disappointment or a surprise to everyone. Chief engineer Jervis had predicted several years earlier that the high bridge would win, and admitted it would

please him, since "engineers are prone to gratify a taste for the execution of prominent works."

Of the many other problems facing the builders of the Aqueduct, few were peculiar to that particular project. The residents of the Croton Valley protested the flooding of their land; farmers along the right of way refused to sell their property; people in the towns feared the walls would give way, flushing them out of house and home; and practically the whole of Dutchess and Westchester counties rebelled at the thought of New Yorkers stealing their water. Claims against the city and its workers were frequent and exorbitant. They were a large factor in raising the total cost from the estimated $5½ million to the actual figure of about $12 million.

The Big Celebration

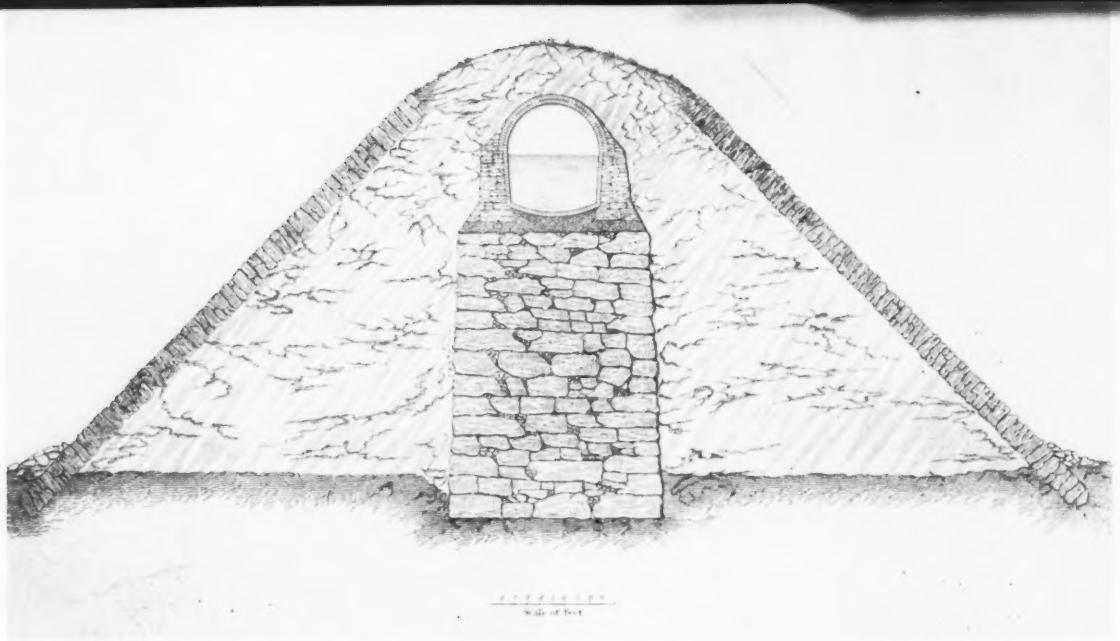
It is doubtful whether the City of New York has ever staged so hearty a celebration, per capita, as greeted the first waters of the Croton to reach Manhattan. The entire Aqueduct, except for the High Bridge, was completed in the spring of 1842. At daybreak on June 22, the valve at the dam was opened, and the water entered the Aqueduct. Later that morning, four persons climbed into a small boat and set out on the new river, bound for New York. Some 22 hours later, the headwaters reached the temporary Harlem River crossing, followed closely by the "Croton Maid" and her safe but tired crew. On June 27, the Yorkville Reservoir at 80th Street was opened, and water finally poured into the Murray Hill Reservoir, at 42nd Street, on the 4th of July, 1842. But the official dedication was yet to come.



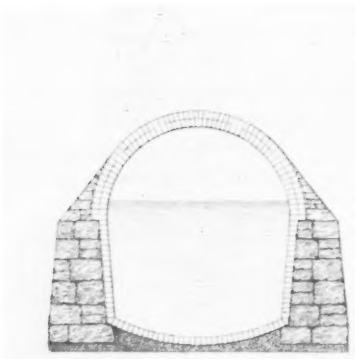
The Aqueduct near Sing Sing. An elliptical arch of 88 ft span crossed a stream, a roadway, and an old mill.

October 14 was set aside for the ceremonies and the general celebrating of the city's new water supply. All the church bells in New York rang from dawn till dusk; the firing of 100 cannon signaled

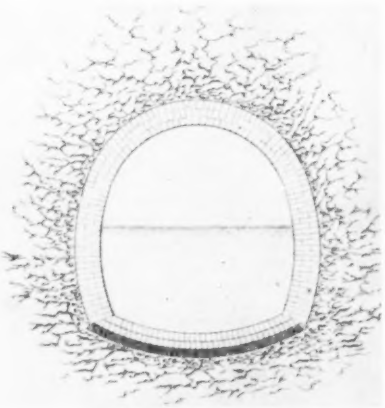
The view from above the Croton Dam, showing the steep left side of the valley. In the center are the gate house and spillway. At the water level on the left is the stone marking the mouth of the Aqueduct.



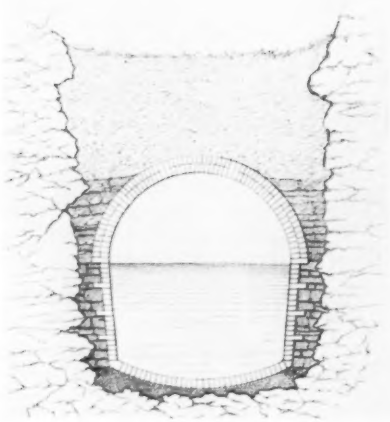
A cross-section of the Aqueduct as it was built up across the valleys and other places where the surface of the ground fell below hydraulic grade. The foundation wall is made of dry stone, filled with gravel. The completed wall was left standing for several months, to give the stone time to settle before adding the weight of the Aqueduct itself.



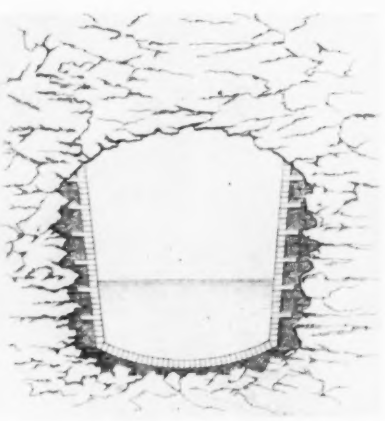
The general form of masonry for the Aqueduct had a nearly flat bottom with a half-round top of double brick. It was used mostly for earth excavations.



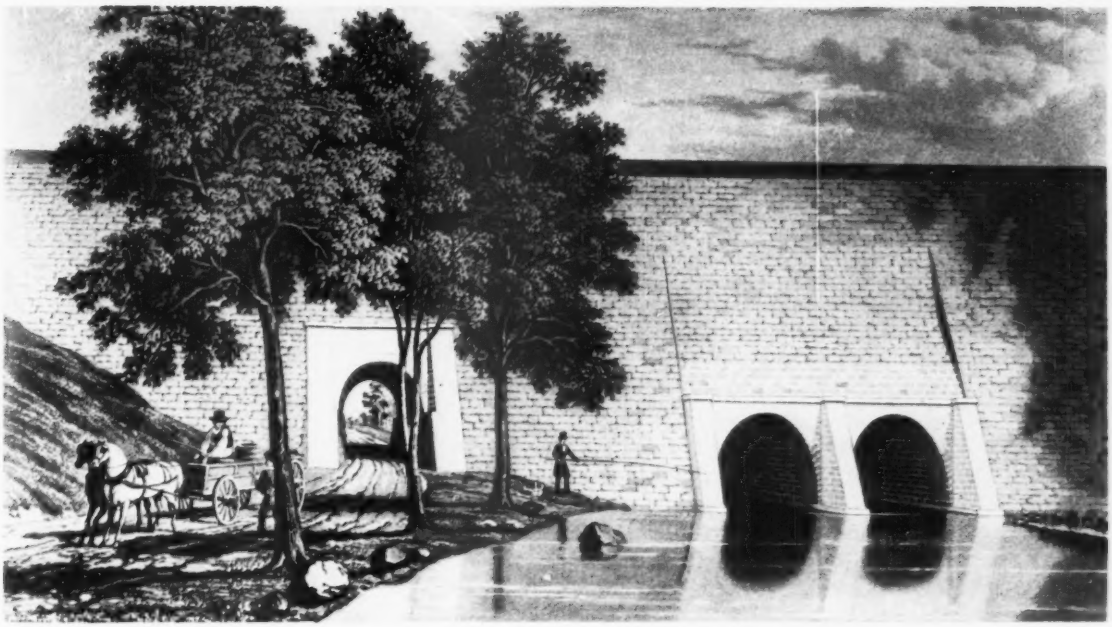
Tunnel sections through earth were cut to shape, and brick was laid flat against the sides of the tunnel. The Aqueduct was nearly round at this spot.



In stone excavations, concrete was used for foundations and stone for sides. The double brick arch was covered with loose fill to the previous ground level.



Tunnels in rock were much the same as rock cuts. A section of sound rock was often left as the roof of the channel-way. At some places arches were needed.



The Croton Aqueduct near Yonkers. The 20-foot culvert on the left is for a public road; the two 25-foot arches span the Saw Mill River. A dam just beyond the Aqueduct backs up the river, making it seem bigger than it is.

the start of a 5-mile-long parade which included regiments of troops, over 50 fire companies, and some 30 different marching temperance societies; dozens of bands played throughout the island; the Governor, the Mayor, and the Water Commissioners made speeches. People literally danced in the streets. The preoccupation with water was so great that some (probably from the marching temperance societies) insisted there was not a drunk person to be found in all of New York. The city had gone on the wagon, en masse.

The Croton Aqueduct

The first Croton Aqueduct (a second was built in 1895), meandered roughly parallel the Hudson as far as Manhattan Island. There it crossed the Harlem River near the present site of Yankee Stadium, and ended in a receiving reservoir between 6th and 7th Avenues near 80th Street. From here it was piped to a distributing reservoir at 5th Avenue and 42nd Street, the present site of the New York Public Library. Total length of the Aqueduct was slightly less than 41 miles.

The second Croton Aqueduct, built to augment and then replace the first, was on a virtually straight line from the Croton Dam to the receiving reservoir, and was 10 miles shorter. The first had been almost entirely cut-and-cover, the second was almost entirely tunnel.

The five middle spans of the famous Harlem River High Bridge were replaced in 1927 by a 425-ft arch steel girder span. But when it was officially opened in 1842, the Croton Aqueduct was the pride of New York, and one of the major engineering accomplishments of the century.

The Benefits of Pure Water

Tower appended to his book a dissertation, by Dr. Charles A. Lee, on the history, glory, science, and benefits of water. The good doctor's scientific explanations were generally accurate, if a little dull for the modern reader. Unfortunately, Dr. Lee's section of Tower's book was not illustrated — it is a little disappointing not to find pictures for such statements as, ". . . in consequence mainly of the introduction of the Croton River into the City of New York . . . we may doubtless look with confidence for a decided improvement in personal comliness and beauty." For, as he quotes an otherwise anonymous Dr. Jackson, "It is evident that the health of a whole community may be so affected by impurities in the water drank by them, as to give a peculiar morbid expression to their countenances . . . Who has not remarked the expression common in some of our cities, as in New York and Boston, which is called a 'care worn and anxious expression?'" Further on, in a footnote, Tower remarks that, ". . . it has been computed that the Boston people have drunk sufficient lime (by 1843), were it all collected, to build the Bunker Hill Monument as high as it was ever designed to be carried." Truly, water is a remarkable mineral. ▲▲

Get Maximum Heating Coil

DONALD E. McLEOD, Chief Mechanical Engineer
West American Engineering Company, Inc.

THE MOST COMMON method of heating air for the heating or air conditioning of modern buildings is to employ extended surface fin and tube coils with either steam or hot water as the heating medium. Seldom, if ever, in medium or large size projects, is direct-fired heating employed, even though somewhat lower first costs can be anticipated with this type of system.

Typical Coil Systems

Steam heated coils give fairly satisfactory results when properly selected and applied, but they have definite limitations. Steam at 2 psi has a temperature of 219 F, while at 10 inch vacuum it has a temperature of 193 F. This serves to limit the smooth capacity modulation of a coil, particularly in the lower ranges. Steam piping is larger than hot water piping with the same heat carrying capacity, hence more expensive. This is also true of the steam specialties that are required for the system, both in first cost and in maintenance.

Hot water coils can give perfect results if properly selected and applied. They offer the opportunity for 100 percent rangeability, with smoothly modulated control and no stratification of air at any load. When improperly selected or applied, however, they can be exceedingly erratic in behavior, particularly at low loads. Perhaps the most common error leading to poor operation is the insistance on the part of some engineers and most governmental agencies that a coil must have not less than two rows, must be designed with a 20 degree water drop, and have flow rate control. This generally leads to an over designed coil which necessitates the use of face and bypass dampers in order to achieve any reasonable degree of control of operation.

Even when coils are properly selected for a maximum design load, flow rate control alone will not give ideal results. Coils seldom operate at design conditions. Most of the time they are at less than maximum, more than half of the time they are at less than half of design load. The recommended design temperatures in the 38th Edition of the *ASHRAE Guide* have a probability of occurrence of once in 13 years, so we can assume that during the 50-year life expectancy of a building the coil will operate at design load only four or five times. As indicated in Fig. 1, when flow rate control is used, the flow rate is only 10 percent when the coil is operating at 50 percent capacity. This, as in the case of steam coils, means that the valve is operating as a two-position, rather than a modulating valve, unless expensive characterized plugs are used. Flow rate control, particularly in the use of one row coils, presents the danger of stratification of the air.

Performance

In late years, many engineers have been turning to larger temperature drops in an effort to design more economical systems. True, the piping, pumps, and pumping costs are smaller with an 80 or 100 degree drop than with the old 20 degree drop, but, if flow rate control is used, we are still faced with the same problems. Stratification is an even greater danger than formerly. Under these conditions, some form of temperature control or temperature reset control must be incorporated in the design.

A single coil system can be controlled quite satisfactorily by variation of water temperature with outdoor reset control. If coupled with flow rate control or other means of adjustment to the indoor requirement, the results can be excellent. In multiple coil systems, the combination of coil flow rate control and water temperature reset can become rather cumbersome and expensive. With this method, the outdoor controller must be carefully located for the coldest exposure to insure that the coldest zone will have adequate heating at all times. On larger projects, it often will be necessary to use more than one zone of outdoor control. Also, on larger projects, where piping systems are long or more than a few coils are involved, pumping costs can rise unduly because of the necessity of designing the system for the maximum pressure drop. Coils near the pump or with low pressure drops create balancing problems and greatly unbalanced pressures on control valves. A control valve tends to be erratic in operation when pressures are unbalanced.

Water temperature control with constant flow rate for each coil offers many advantages and few disadvantages. Fig. 2 shows the ideal relationship that exists between the heating capacity of a coil and the difference between entering water and entering air temperatures.

Use of Secondary Pumping System

All of the foregoing difficulties involved in the heating of air with water can be avoided by the

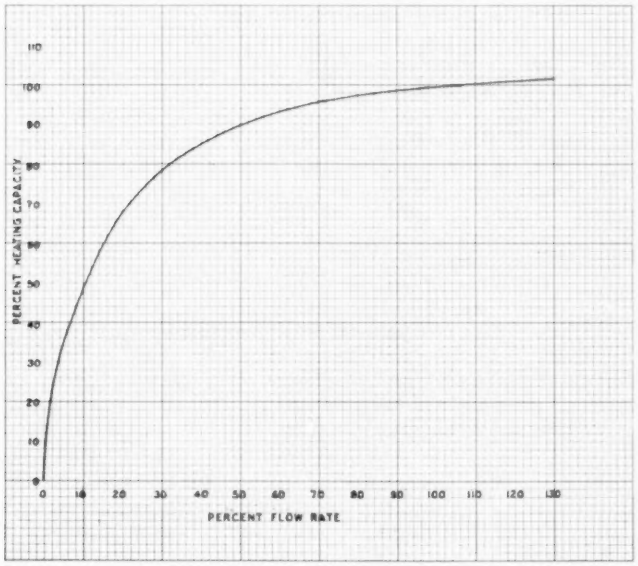


Fig. 1 — Variation in heating capacity of a typical hot water heating coil with flow rate control and constant temperature difference.

use of a secondary pumping system. At the same time, pumping horsepower requirements will be less in most systems than with a single pump system. The secondary pump for each coil is connected to the coil and the heating mains as shown in Fig. 3. Note that the connections from the coil to the bridge across the heating mains (Point A) is made for a negligible pressure differential between suction and discharge connections. The circulating pump and basic type three-way valve often cost less than the linear flow characteristic valve usually employed with coils in the single pump system.

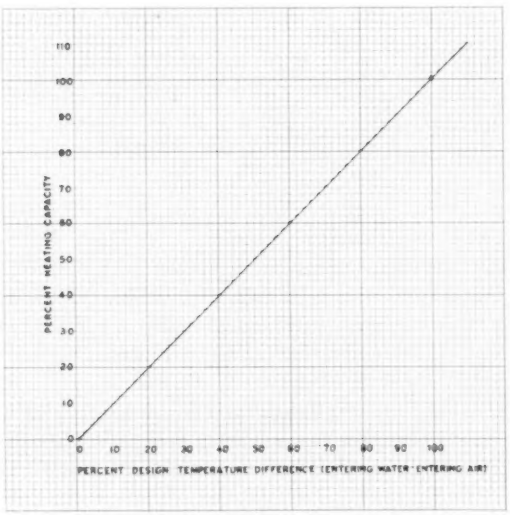
Referring to Fig. 3, the bridge from supply to return main should be designed and balanced for the flow required by the coil at design conditions, and the size of mains be reduced accordingly to carry only the quantity of water that is required by elements further downstream. In this way, the maximum economy of piping design is realized. The mains are designed for a comparatively low pressure drop in order to more nearly equalize the pressure drops for the bridges throughout the entire system.

With this system, the flow rate through the heater as well as the coils is held constant and water temperature in the primary circulating system is also constant, which simplifies the control of the heating boiler or converter and minimizes problems with it. Control of the coil's three-way valve by a space or duct thermostat insures that the output of the coil will be exactly as required for the load. When no heating is required, the pump may be shut down. If this is done, and the coil is subject to freezing, an additional thermostat, set to start the pump at a drop in temperature to 40 F, should be installed on the upstream side of the coil as a safety measure.

With water velocity in the coil maintained at 0.5 fps or greater, there is no danger of coil freeze up under conditions normally encountered in air conditioning work. Rather extensive tests, made some years ago by John J. Nesbitt, Inc., prove this conclusively. Other than secondary pumping, no system prevents coil freezing at so little cost. Even the so-called nonfreeze type of steam coil will freeze more readily than a water coil with proper water velocity.

Coil Selection and System Design

Two coils, selected from several on a recent air conditioning project will illustrate the coil and sys-



Formulas for Curve

Case I. Where R is less than 1

$$\Delta T_A = (EWT - EAT) \times (B - 1) \div (B - R) \quad (1)$$

Case II. Where R is equal to 1

$$\Delta T_A = (EWT - EAT) \times 1 \div [1 + (1.085 \div K)] \quad (2)$$

Case III. Where R is greater than 1

$$\Delta T_A = (EWT - EAT) \times (D - 1) \div (RD - 1) \quad (3)$$

Where:

$R = cfm \div (461 \times gpm) = \Delta T_W \div \Delta T_A$

$B =$ Antilog $K \times (1 - R) \div 2.5\ V_A$

$D =$ Antilog $K \times (R - 1) \div 2.5\ V_A$

$K =$ Over-all heat transfer rate/sq ft/degree, for coil being considered

$V_A =$ Coil face velocity, fpm of standard air

$EWT =$ Entering water temperature

$EAT =$ Entering air temperature

$\Delta T_A =$ Rise in air temperature

$\Delta T_W =$ Drop in water temperature

Fig. 2 — Ideal relationship between heating capacity of a hot water coil and the difference between entering water and entering air temperatures, using water temperature control and constant flow rate.

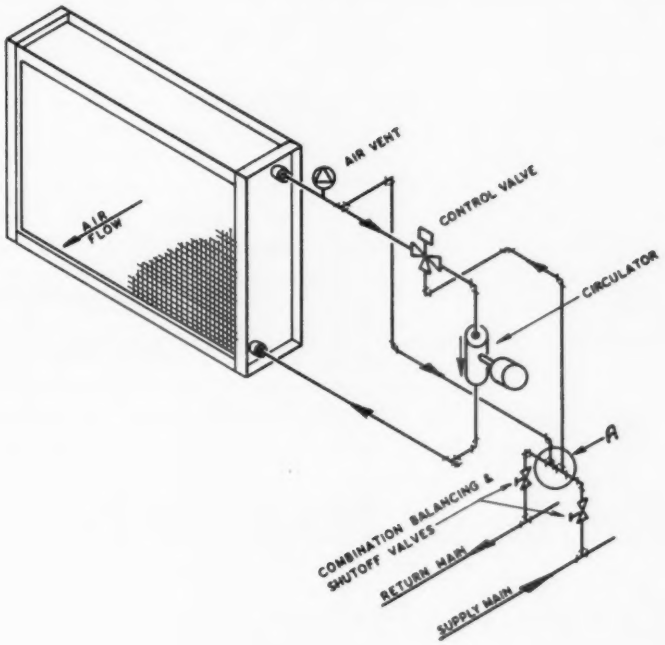


Fig. 3 — Typical coil piping connections for design using a secondary pumping system. This arrangement provides a constant flow rate in the heater and simplifies boiler or converter control.

tem design method which we have found to be economical, efficient, and trouble free.

Heating Coil No. 1 — Primary Heating Coil

DUTY: To heat 9250 cfm from 50 to 95 F, or provide 450,000 Btu/hr

ASSUME: 200 F EWT and $\Delta T_W = 40$ F, requiring 22.5 gpm

TRY: Aerofin Series 80, full circuit coil, 25-tube face by 78-in. length, face area of 17.9 sq ft

$V_W = 1.15$ fps Med. = 107.5 degrees

$K = 137$ Btu/degree/row $V_A = 517$ fpm

CALCULATED REQUIREMENT: 1.65 rows

SELECTION: Aerofin Series 82, 24-tube face by 78-in. length, face area of 17.9 sq ft

ADJUSTMENT OF CALCULATIONS:

$$R = \text{cfm} \div (461 \times \text{gpm})$$
$$= 9250 \div (461 \times 22.5)$$
$$= 0.893 \text{ (Coil is Case I)}$$
$$\text{Log } B = K \times (1 - F) \div 2.5\, V_A$$
$$= 274 \times 0.107 \div 1290$$
$$= 0.022715$$
$$B = 1.0537$$
$$\Delta T_A = 150 \times 0.0537 \div 0.1607$$
$$= 50.13 \text{ degrees (Equation 1)}$$
$$\Delta T_W = 50 + 150\ (45 \div 50.13)$$
$$= 185 \text{ degrees (New Med} = 92.5 \text{ degrees)}$$

COIL CHECK:

$$\text{Coil Output} = 2 \times 137 \times 17.9 \times 92.5$$
$$= 452{,}000 \text{ Btu/hr}$$

Heating Coil No. 2 — Room Booster Coil

DUTY: To heat 500 cfm from 60 to 80 F, or provide 10,850 Btu/hr

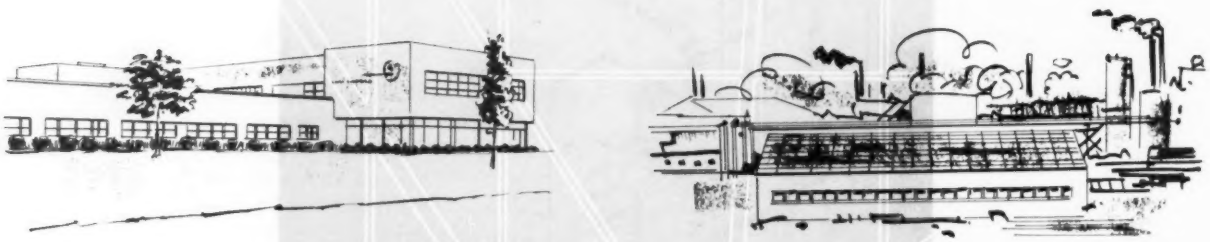
SELECTION: Aerofin Series 81, 6-tube face by 18-in. length will have a leaving air temperature of 80 F with 60 F entering air when supplied with 3.75 gpm of water at 140 F. The water temperature drop will be: $\Delta T_W = 10{,}850 \div (3.75 \times 500) = 5.8$ degrees.

The secondary pumps for these coils will be: No. 1, a 1½" in-line booster with capacity of 22.5 gpm at 7.5-ft head, 1/6 hp; No. 2, a ¾" in-line booster with capacity of 3.75 gpm at 7.5-ft head, 1/12 hp. In each case, the pump has sufficient head capacity to permit control valve selection at a 2 to 2½ psi drop, which will permit smooth and accurate capacity control as shown in Fig. 2.

The heating water for this system is designed to operate at 220 F. By proportion, we determine that Coil No. 1 requires 12 gpm of 220 F water to maintain 185 F water in its system, and Coil No. 2 requires 0.22 gpm of 220 F water to maintain 140 F water in its system, when operated at maximum design load. On this basis, the primary pump and the heating mains are designed for a temperature drop in excess of 75 degrees, with all the resultant economies of the high temperature drop system. Smooth and accurate control of air temperature is maintained without stratification at all conditions.

A further economy in the foregoing method of design is that no special products are required; the standard products of any reputable manufacturer can be used. Coils do not require special constructions, circuiting, or fin spacing. Control valves do not require special plug characteristics in order to function well.

This method of design applies not only to coils, but to other types of heating systems. Combination systems, using heating coils with perimeter convectors or baseboard, function perfectly. Similarly, on large systems using high temperature hot water as the heating medium, buildings or equipment can be directly connected to the high temperature mains without using converters or reboilers, yet operate within themselves at safe temperatures in conventional equipment. ▲▲



Use Performance Standards to Zone Industry

MARVIN A. SALZENSTEIN
McCrone Associates

INDUSTRIAL LAND is becoming scarce in the large population centers of the United States. Manufacturers seeking new space find that communities are cautious and apprehensive about zoning attractive sites for industry. City planners are earnestly trying to reconcile the differences created by the competing demands for land for residential, commercial, and industrial development. The establishment of performance standards for industrial zoning, essentially a new industrial zoning technique, has taken a firm hold on this country and promises more land for manufacturing purposes as well as nuisance reduction for the rest of the community.

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The Use List

Prior to performance standards, the most common technique for industrial zoning was the "use list." Prohibited or permitted industries were listed, by type or product, for an industrial zone. For example, in a typical light manufacturing zone an electronics assembly plant may be permitted while a chemical works is prohibited.

The use list has several serious objectionable features:

¶ It can never be complete enough to include all industrial processes. Technical advances and new products will make a use list obsolete very quickly.

¶ Its designation of an industry does not adequately describe its nuisance value. Take, for example, paint manufacturing. One plant could be a collection of odorous, unsightly buildings with a high fire hazard to neighboring industries, while another plant could be a modern structure, with air pollution control devices and maximum fire protection equipment.

¶ The important factor, size of the operation, is neglected. The amount of air pollution, for example, from most factories is not only dependent on the product manufactured, but also depends on the size of the plant.

¶ There is no incentive for a classically dirty industry to improve and clean up its operations in order to build in a more desirable area.

The Performance Standard

In 1951, Dennis O'Harrow, now director of the American Society of Planning Officials, first put forth the idea that it was technically feasible to zone industry logically by limiting the amount of nuisance emitted from a manufacturing facility. Since it is possible to scientifically measure noise, air pollution, vibration, industrial wastes, and similar nuisances, maximum limits could be established for each nuisance. Thus, an industry of any

type could build in any particular industrial zone, provided it did not exceed accepted performance standards for that zone.

These performance standards answer every objection to the use list. They have been developed to limit the following industrial nuisances:

¶ Smoke and particulate matter (fuel burning)
¶ Smoke and particulate matter (other than fuel burning)
¶ Toxic matter
¶ Odorous matter
¶ Fire and explosive hazards
¶ Glare and heat
¶ Noise
¶ Vibration

The units, numbers, and methods used are tailored to each community to best meet the desires and needs of that community.

The development of performance standards for a given area is a complex process, but once the job is done, the consulting engineer will be expected to tailor his designs to meet the varying industrial performance standards established in each applicable zoning code.

A Typical Standard

Examination of a typical noise standard will reveal the nature of the performance standard designed specifically for industrial zoning. The standard, shown in Fig. 1, appears in the Cook County, Illinois, Zoning Ordinance, which was approved and has been in effect since May 1960.

Note that the maximum permissible sound level in the Cook County Ordinance decreases at the higher noise frequencies. Since the human ear is more sensitive to higher pitched sounds, the maximum permitted levels are related to the frequency of the sound. The engineer then, must determine, with some degree of accuracy, the expected noise level at the nearest residential or business district boundary line on a proposed site. Much noise data is currently available from machinery manufacturers and handbooks, and provides the decibel frequency curve at a given distance. Under free field conditions, the sound level can be expected to drop 6 decibels with each doubling of distance from the source. (It should be pointed out that this factor will vary with the wind, type of ground, topography, noise spectrum, and geometry of the source). At times it will be necessary to make field measurements on an already existing operation to determine exact levels.

Once the expected noise level has been determined at the nearest residential or commercial district boundary line, the values can be compared with the maximum permitted levels. If such values are equal to or are in excess of the maximum permitted sound level, some means must be found to attenuate the noises. This can be done by either of the following methods:

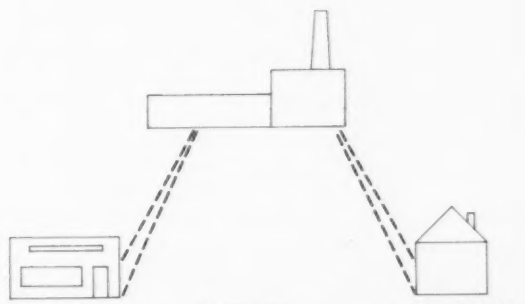
¶ Source Control – Can the noise making machine be redesigned or replaced with a less noisy one to lower the sound level? Perhaps the machine can be mounted in such a way as to isolate or damp out the noise produced.

¶ Transmission Control – If enough land is available to situate a noisy operation far from the residential or commercial district, this would be the obvious approach. Filtration control with mufflers, for example, may be used to favorably change noise characteristics, or the noise source can be completely enclosed to lower the sound level outside the industrial complex.

Each of these methods can result in a predictable noise level drop. In most projects, a little thought given to noise source placement and control will be more than ample to meet performance standards. More difficult projects will, of course, require the services of an accoustics expert.

Conformance Responsibility is Consultant's

The engineer must satisfy himself that the other potential industrial nuisances covered by the performance standards are well within the maximum limits specified. Where nuisances may arise in an industrial operation, it is prudent to consider the various control methods and devices available. Some of these are outlined in Table 1, which lists



Business District Maximum Permitted Sound Level (Decibels)	Octave Band Frequency (Cycles Per Second)	Residential District Maximum Permitted Sound Level (Decibels)
79	0-75	72
74	75-150	67
66	150-300	59
59	300-600	52
53	600-1200	46
47	1200-2400	40
41	2400-4800	34
39	Above 4800	32

Fig. 1 – "In the M-1 District (Restricted Manufacturing), at no point in the boundary of a Residence or Business District shall the sound pressure level of any operation or plant . . . exceed the decibel limits in the octave bands designated . . ." – Cook County, Ill.

TABLE 1
INDUSTRIAL NUISANCE CONTROLS

I. Smoke and Particulate Matter (Fuel burning)

A. Raw material control
   1. Removal of smoke-producing constituents from fuel
   2. Use of higher grade non-smoky fuels

B. Operation Controls
   1. Oil preheaters
   2. Generous excess air
   3. Open-fire air jets
   4. Stoker feeding
   5. After burner
   6. Smoke indication

C. Collection
   1. Electrostatic precipator
   2. Bag houses
   3. Scrubbers and high efficiency inertial separators

D. Diffusion and dilution of smoke with clean air

II. Smoke and Particulate Matter (Other than fuel burning)

A. Raw material control
   1. Enclosures
   2. Wetting

B. Operation Controls
   1. Enclosure
   2. Condensers for fumes and gases

C. Collection
   1. Inertial collectors
   2. Cloth filters
   3. Electrical precipitators
   4. Wet collectors and scrubbers

D. Diffusion
   1. Dilution with clean air
   2. High stacks
   3. High velocity and temperature of exhaust gas

III. Toxic Matter

A. (See II — Items A. through D.)

B. Removal in exhaust stream
   1. Chemical neutralization in scrubbers
   2. Catalytic or chemical reaction in exhaust stream
   3. Adsorption

IV. Odorous Matter

A. (See II. — Items A through D, and III — Item B.)

B. Good housekeeping and efficient waste disposal

V. Fire and Explosive Hazards

A. Flash point Control
   1. Substitution of lower flash point materials
   2. Use of fireproof or fire resistive materials

B. Storage Control
   1. Adherence to NFPA standards
   2. Limit quantities kept on hand
   3. Underground tanks and sealed containers

VI. Glare and Heat

A. Enclosure
B. Shielding from line of sight
C. Lower intensity sources
D. Removal of flicker or flashing

VII. Noise

A. Source Control
   1. Design of mechanism
   2. Damping
   3. Isolation

B. Transmission Control
   1. Isolation
   2. Filtration (muffler)
   3. Shielding
   4. Quieting (sound absorbers)
   5. Distance

VIII. Vibration

A. Source Control
   1. Design of mechanism
   2. Damping
   3. Isolation

B. Transmission Control
   1. Isolation
   2. Decoupling
   3. Soil conditioning
   4. Distance

control methods for eight industrial nuisances common to many industries.

The consulting engineer should be in a position to check any of the possible nuisances emanating from a plant after it is built. Measurement of the actual nuisance produced may be necessary to insure operation within the required performance standards. Stiff fines are generally provided for non-compliance with the zoning code. In Cook County (Chicago) the fine is a maximum of $200.00 for each day the violation occurs.

Industrial performance standards for zoning is a relatively new concept. It adds more time to the design of a factory, it deals with higher levels of engineering, and it costs more to administer. But the benefits are many. Land can be more equitably apportioned among the competing users, real estate values are stabilized, and industries are protected from each other while also protecting the neighboring residences. Industrial performance standards provide a better way of living and working in a community. ▲▲

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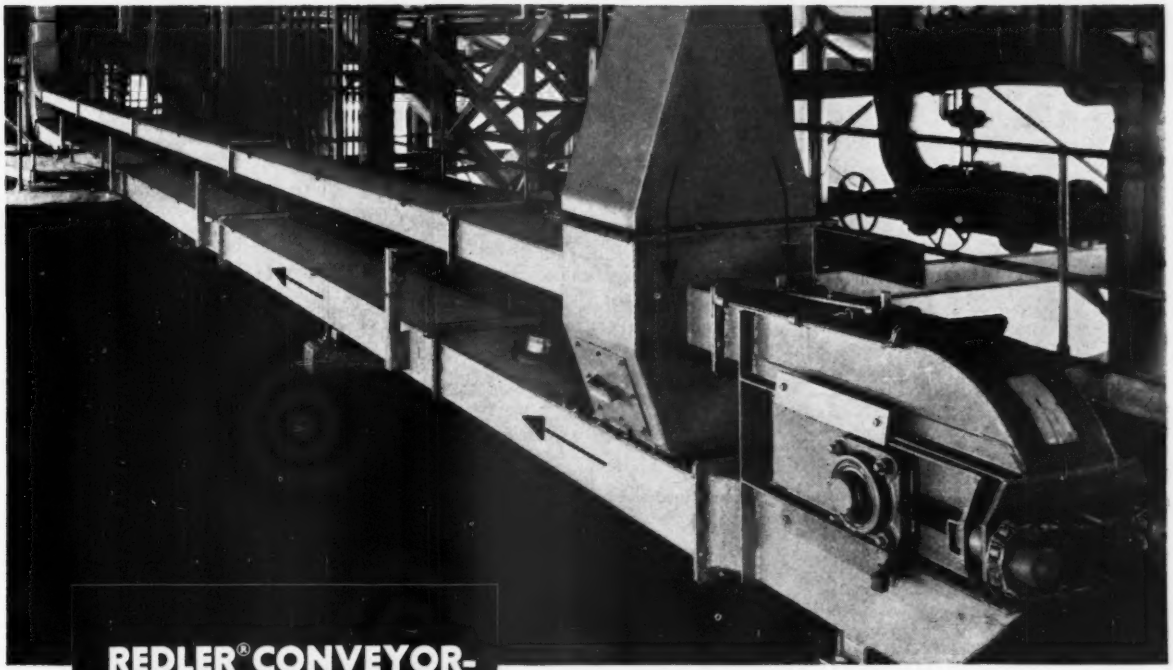

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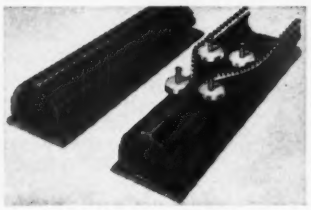

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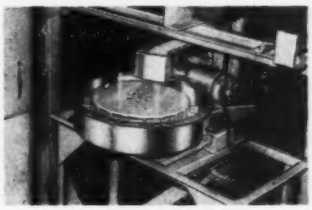

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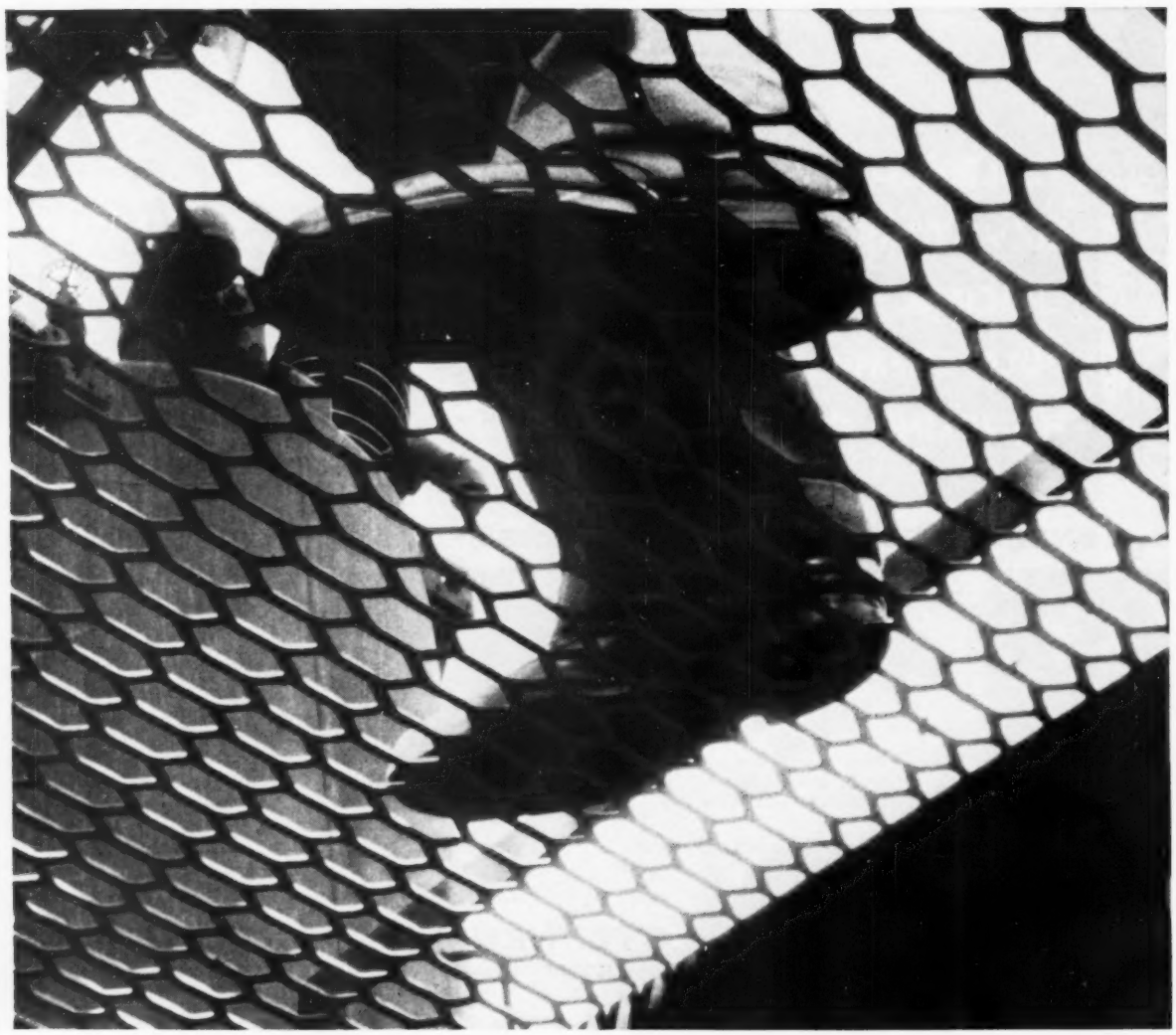


An Engineer Looks At the Railroads

HARRY F. BROWN
Gibbs & Hill, Inc.

CE exclusive

THE YEARS since the war have found all public utilities except the railroad industry sharing in the country's growth and general prosperity. The power and the communication utilities are expanding their plants and services and have had no difficulty in securing capital. Only the railroads, to which the nation is deeply indebted, face a struggle for existence. Some have already vanished.

Although the total investment in the railroad industry grew from $26 billion in 1930 to a current $35 billion, all railroads have reduced their mileage or their service, or both. The reasons for these reductions are well known. No other utility has had as much competition as the railroads. And the competitive systems — highways, waterways, and airways — all get some government subsidies. Not only that, but intercity passenger traffic is now about 90 percent by private automobile. The airlines carry about 4 percent of the passenger miles, with the railroads and the intercity bus lines each carrying about 3 percent. Contrast this with 1910 when the railroads carried nearly all the passengers and more than 80 percent of the intercity freight. In 1940, the railroads were carrying about 62 percent of the intercity freight, with 16 percent going to the waterways and 11 percent each to the highways and pipelines. By 1958, the railroads' share of this freight traffic had dropped to 45.4 percent; the highways were carrying 21.3 percent; the pipelines 19 percent; and the waterways the remainder of 14.3 percent.

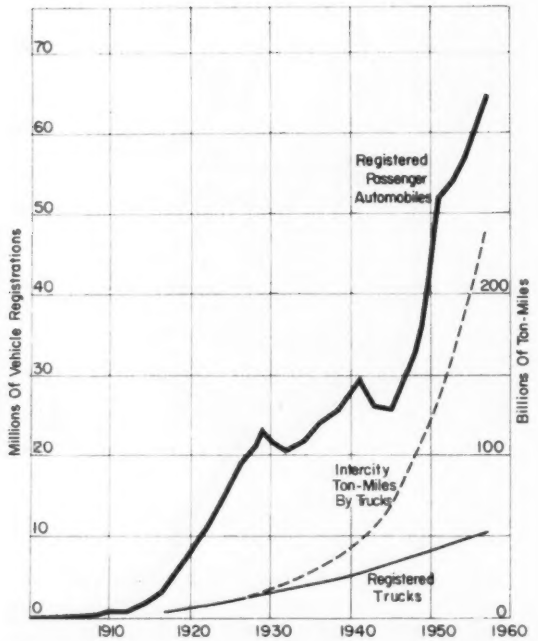
The loss of all this traffic to competitors would suggest that the railroad industry is a declining one, and it is so regarded by many people, including investors. As a result, many railroads have found it difficult to raise capital for modernization of their plant and equipment. Nevertheless, the total demand for transportation has been increasing over the years, so that the freight traffic carried by railroads has remained more or less stable, varying almost directly with general business conditions during the past decade.

Measuring the Railroads' Output

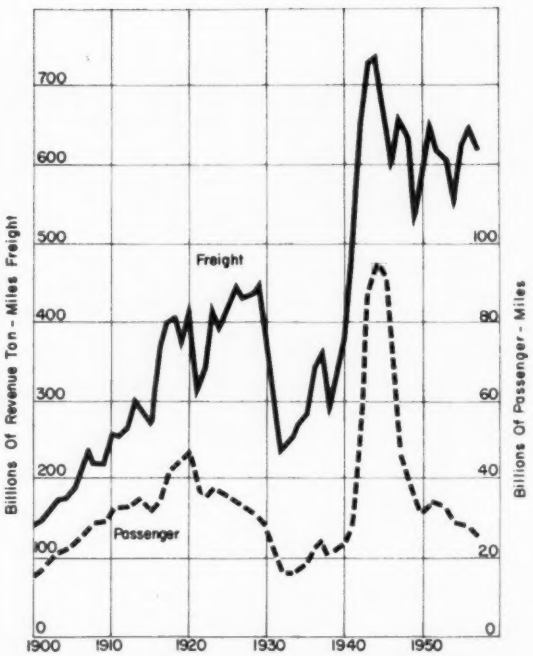
The output of the railroads can be measured in ton-miles produced over a period of time, and all the factors required to produce this output — the man-hours, the fuel, the cars, the motive power, the tracks, and the other facilities — can be expressed in dollars. The ratio of the output in ton-miles per year to the total of all the dollars paid out per year to produce the output is the measure of the operating efficiency.

In reviewing the statistical data relative to the ton-miles produced and the costs of their production each year for the past two decades, it would appear that this operating efficiency has declined. However, the 1935 dollar could purchase more of any commodity than our current dollar, so we must, in making comparisons, be sure that we are inserting the same dollar in the formula. Using the value of the 1958 dollar, it can be shown that this ratio of output in ton-miles to dollar cost has shown a steady improvement during the postwar years. This gain has continued in spite of the nearly stable traffic on Class I railroads as a whole.

Any railroad can determine, each year, whether its operating efficiency is increasing or declining and can compare its own efficiency with that of all Class I railroads. But if it is easy to see which way a railroad is headed, it is not as easy to see why. This is a problem that requires expert engineering analysis. Many factors involving plant and



Highway vehicle and truck freight traffic growth since 1900 – Automobile Manufacturer's Association.



Revenue ton-miles and passenger miles on all Class I and II railroads – Interstate Commerce Commission.

equipment, as well as traffic and operation, are involved. It is possible for an improvement in operating efficiency to be brought about through a loss of traffic. For example, the loss of the short-haul, slow speed, light tonnage freight and local passenger traffic to the highways since 1920 may have favored operating efficiency. If this is true, then it should be recognized, and endeavors to recapture that business should be stopped.

Thus, an analysis and appraisal of operating efficiency is an important engineering problem facing many of the railroads at the present time. Consulting engineers should be able to help them solve this problem.

There is, however, another side to the coin. It is possible that the reduction or elimination of individually inefficient services can be collectively harmful. For example, faster, more frequent schedules may reduce operating efficiency, but if slow service or lack of service contributes to a decline in railroad traffic, then it becomes necessary to find out if operating policies may have improved the operating efficiency at the expense of the market. Longer and fewer trains have improved efficiency, but the railroads may have pursued this policy too far. Possibly faster and more frequent service would increase the sales. Efficiency means nothing when business volume has dropped to nothing.

The railroads must find out whether faster and more frequent service can be provided without materially increasing the cost of operation. This is an engineering problem – one consulting engineers could help to solve.

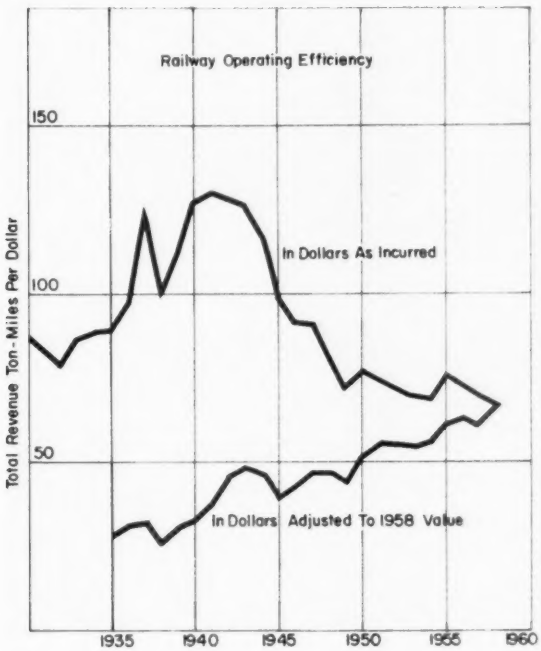
The Switch to Diesel Power

Railroad motive power has been switched from steam to diesel during the postwar period. More than $3 billion has been spent by the Class I railroads in making this change, and the diesel has received a great deal of the credit for gains in operating efficiency. However, a careful analysis of the cost data does not substantiate many of the claims made for the diesel's share in effecting this improvement. It is now beginning to appear that the diesel has a much shorter life than the steam locomotive – even though it cost more. It is probable that the diesels now in service, the average age of which is about 7 years, will require extensive rehabilitation or replacement within a few years.

This will not only present a major financial problem to the railroads but a major engineering problem as well. In fact, it seems probable that in the face of these motive power replacements, some railroads having good traffic density and located where electric power is available, will find it profitable to change from diesel to electric.

A Look at Electrification

New techniques in railroad electrification developed in Europe and in this country during recent



Revenue ton-miles per dollar of total Class 1 railway operating expense plus interest on investment.

years have revived interest in this form of railroad motive power. A substantial amount of the rail mileage in Europe is electrified, with additional mileage being electrified each year on the railroads of every continent except North America.

The opinion of many American railroad economists, to the effect that railroad electrification requires too large an investment to justify its use, can be shown to be erroneous in the light of the rapid consumption of capital by diesel motive power. Where sufficient traffic density prevails, the total investment in fixed property requirements for electric operation, plus that for motive power, can be less over the life of the investment than the corresponding investment required for diesel power over the same number of years.

In addition, the operating savings over these years with electric operation can be startling. At the present time, the cost of electric power for railroad operation in many sections of the country is about equal to the cost of diesel fuel. But the price of liquid fuels is rising at a much more rapid rate than the price of electric energy.

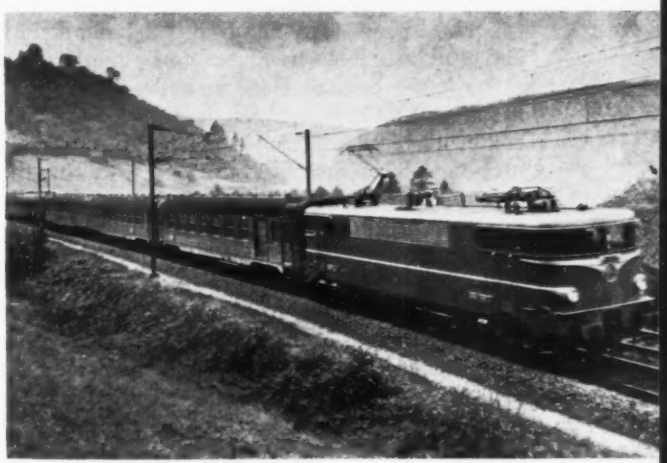
The present economies to be realized from electric operation are not so much in fuel costs as in reduced motive power maintenance costs. With diesel power, maintenance constitutes about 30 percent of the total operating costs of motive power. With electric motive power, these maintenance costs are reduced to 10 percent or even less. With the proper traffic density, the added cost of maintaining the contact system does not perceptably change these ratios.

If faster and more frequent service is at all a requisite for increased output to produce increased earnings, then electric operation is ideal. It affords greater horsepower for greater speeds, and lower operating costs for the greater traffic density resulting from more frequent service.

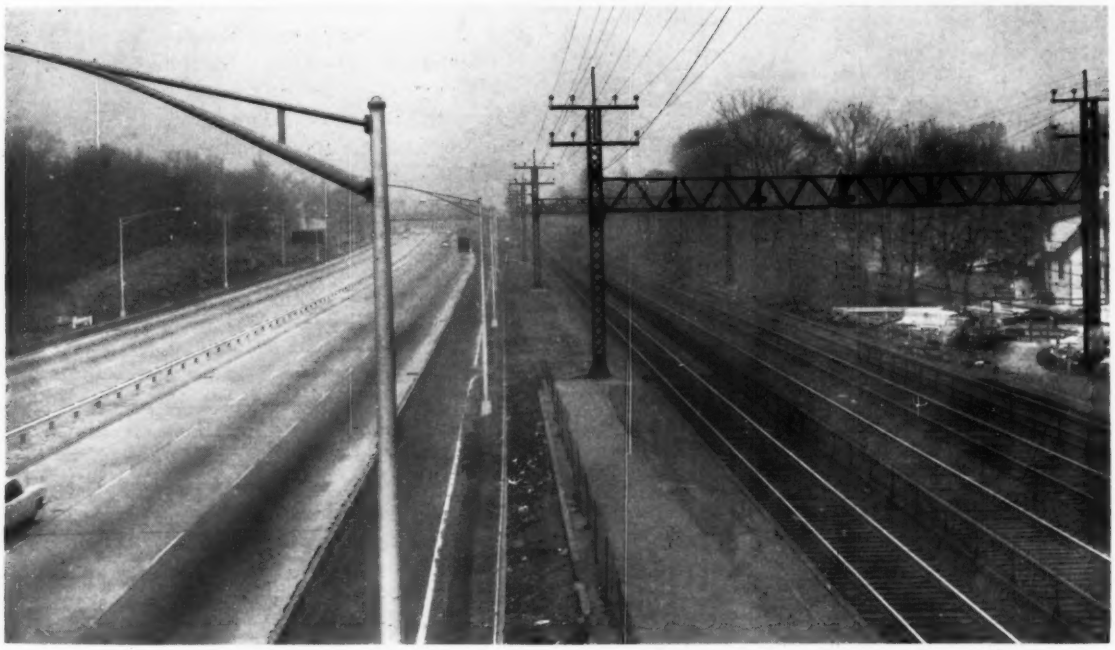
Improved Load Factor Needed

Since traffic density is a requirement for electric operation of the railroads, and essential to operating efficiency and good earnings, the railroads must find ways to improve it. At the same time, this increase must be accompanied by a good load factor – a high average rate of use of the transportation facilities. Lower off-peak rates, and other methods of building up off-peak traffic for the improvement of system load factor are well known to the electric power and communication utilities, but so far, about the only means taken by the railroads to improve their load factor, has been through reducing track mileage. Branch line service has been abandoned and multiple track facilities have been removed. Little effort has been made to spread out the existing traffic over the off-peak periods, or to build up the off-peak traffic. The stress has all been laid on "gains in operating efficiency" and not on improved load factor.

Even the most disinterested traveler is aware of the great duplication of railroad facilities as one approaches any large city or industrial center. Formerly, when the railroads had a near monopoly, each line or system felt that it required its own



Latest electrified train in France uses single phase, 50 cycle, 25,000 v current, rectifier converted to dc.



Parallelism of super highway and main line railroad blocks both from future development or local service.

facilities to meet or beat the competition of the other railroads. This is no longer true. The shipper or traveler can still choose the rail line to be used, but more joint usage of terminals, and trackage along the route, can be advantageous to the railroads and the shippers.

Union Stations in most cities are as old as the railroads. Trackage rights have also been used for many years. It is not necessary to resort to mergers to effect these economies, but however it is managed, the railroads must seek to eliminate waste and duplication and look for a better joint use of parallel facilities. This has been done in many countries abroad and it has improved both traffic density and load factor. It has been done to a limited extent in this country. Good examples are the joint use of Union Pacific and Western Pacific track facilities in Nevada; the joint operation of the traffic between Philadelphia and Atlantic City by the Pennsylvania and the Reading; and the ceding, by the B. & O., of all passenger traffic between New York and Washington to the faster, electrified lines of the Pennsylvania.

About 10 percent of the track in this country carries 50 percent of the traffic, and it is likely that there is much more mileage with superior grades and track facilities that could be given greater traffic density through joint usage by several carriers. If this were done, electrification could be justified on many more miles of the nation's railroad system than it has up to the present.

This is a real engineering problem for the railroads. They must find out how efficiency, improved load factor, lower operating costs, and increased earnings can be effected by the channeling of the rail traffic into the best routes and rail facilities between the larger population and industrial centers. Having done this, they must select the most efficient motive power for this new arrangement.

This may mean that some communities will be without rail service, but communities today have highway transportation facilities, and these can be coordinated with the rail lines that remain.

When the railroads were built, the routes selected generally followed coast lines, river valleys, or attractive topographic contours to provide the lowest gradients with the least cut and fill. These are the best routes not only for railroads but also for highways, so many are being built parallel to existing railroads. In some instances the property of the railroads has been taken by eminent domain for highway purposes.

Highways vs Railroads

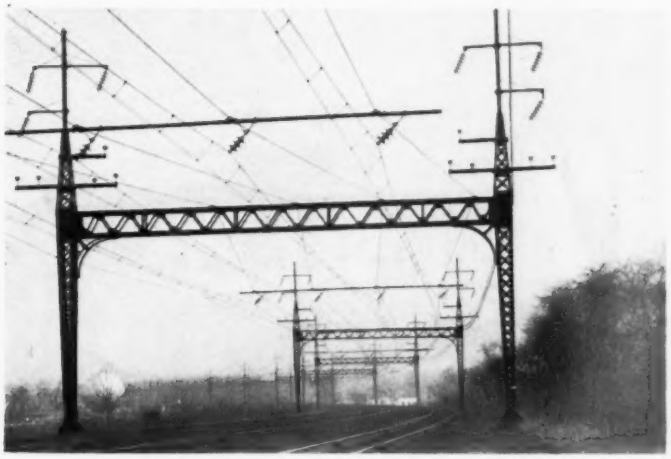
There seems to be two radically different schools of thought concerning the planning and building of these superhighways. One favors building them around the large population centers, with radial connectors to these centers. The other proposes to plow right through the population centers, tearing down homes, commercial buildings, factories, and other property regardless of use or value.

Excellent examples of the first type are the Pennsylvania Turnpike and the connecting superhighways through Ohio and Indiana to Chicago. An example of the second type is the Connecticut Turnpike and its New York Thruway connection to New York City. The Connecticut Turnpike runs for miles adjacent to the main line of the railroad serving southern New England. This construction has permanently blocked off the railroad as well as the new highway, thereby permanently limiting the service value of both. In one major Connecticut city the access to the railway station from the greater part of the city has been limited to a single street, already seriously overcrowded.

Such highway planning which disregards the existing railroad transportation and limits its service facilities, and also disregards the local pedestrian traffic and mass transportation requirements of the city, is thoughtless and inexcusable. Obviously, the railroads need good engineering representation on every state and city highway planning board, not only to see that their rights as public utilities are preserved, but also that their ability to serve industry and the public is maintained. It is in the common interest of the public, industry, and existing railroads to see that such equitable planning is made. All have a vital stake in this matter. The highways, no matter how numerous they become, cannot be expected to fully replace the railroads. Thus, the coordination of highway and railroad planning is another engineering problem — one on which consulting engineers should be working.

Coordinating Utility Facilities

During the past 40 years the electric power utilities have expanded their distribution networks to serve larger and larger areas. Where the surrounding terrain has not been heavily built up, it has been easy to obtain, at reasonable cost, independent rights-of-way power transmission lines. On the other hand, in the highly developed sections of the country this has become quite a problem. In the northeastern part of the United States, the power utilities have found the use of the railroad rights-of-way a desirable and economic solution, and the railroads have found that this use of their air rights gives them an additional and worthwhile source of income.



Railroad right-of-way with electrification structures designed to serve both the railroad and power utility.

There is evidence that this joint use of railroad property by other utilities will not only increase but will be to the economic advantage of both. This means that railroads may find the power supply for their own operation immediately at hand — and the power companies may find a desirable new power customer. The coordination of the facilities for this joint use becomes another important engineering study.

The railroads would do well to consider how some of the other utilities have solved many of their engineering problems. There are many telephone companies operating as private enterprises in the various parts of the country. Yet, they do not compete with each other. The subscriber in Boston uses his local company facilities to call a subscriber served by another company in Chicago. The instruments are identical. The long line connections and facilities belong to still another company (AT&T), while the engineering and research for most of these firms are performed by the Bell Laboratories. Instruments and apparatus are made by the Western Electric Company. As a result of this coordination and cooperation, the United States enjoys the finest and most efficient communications system in the world. Similar cooperation is needed among the railroads.

The railroads have already accomplished a great deal toward standardization and toward the solution of many common engineering problems through the American Railway Engineering Association and through the various engineering sections of the Association of American Railroads. Even more might be accomplished by the railroads in supporting a permanent research organization set up like the Bell Laboratories. A start in this direction has been made in connection with certain track and rail problems. This should be continued and expanded.

These are some of the engineering problems the railroads face. They are difficult, and the railroads have failed to solve them for themselves. But if they are not solved, we can be sure that these great public utilities will not long be functioning as private enterprises. ▲▲

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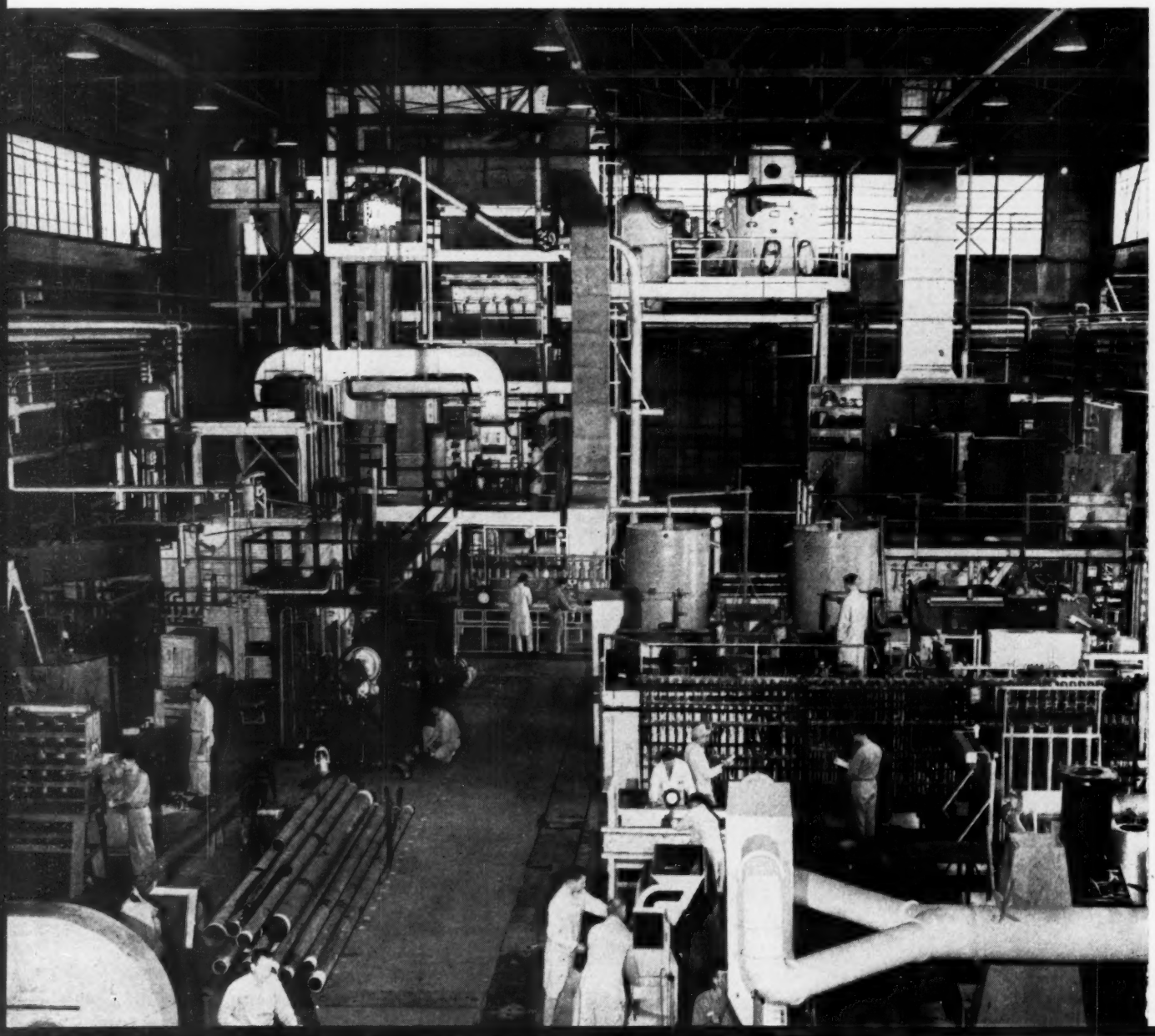

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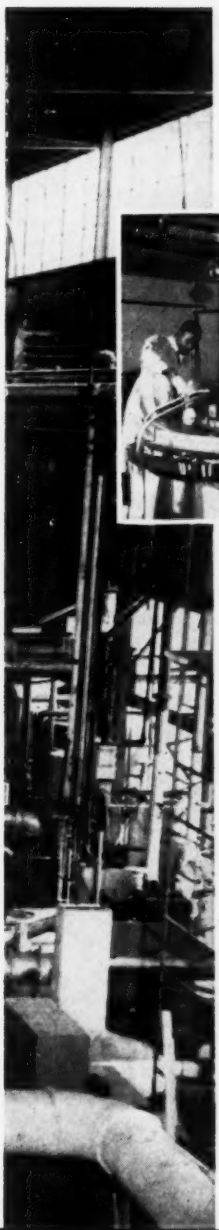

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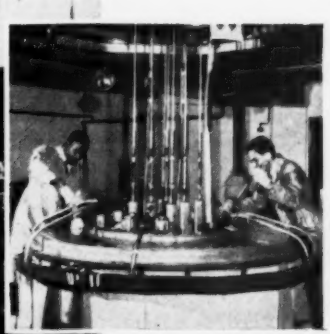

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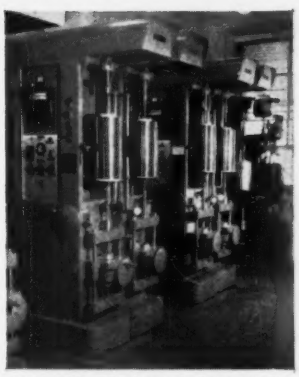

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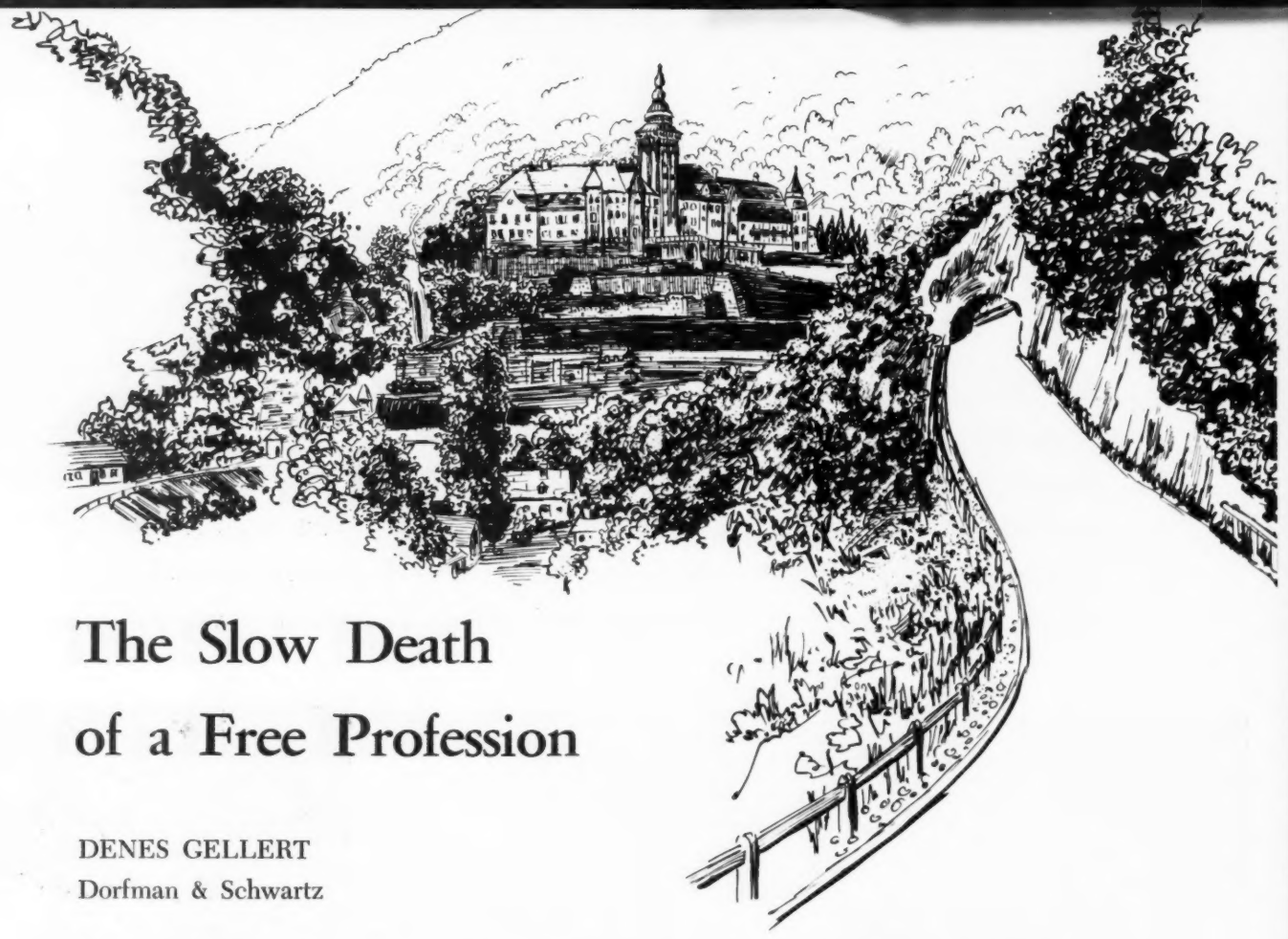


The Slow Death of a Free Profession

DENES GELLERT
Dorfman & Schwartz

HUNGARY was literally torn apart at the end of World War II. Buildings were leveled, bridges destroyed, and plants dismantled. The engineer was to play a large part in the rebuilding, not only in designing the new cities, but in providing work for thousands of unemployed. In 1947, the introduction of successive 3- and 5-year plans produced great industrial growth. The expansion and rebuilding led to a "boom" in the building and designing professions, and it is still going on. Many of the ambitious plans that have been undertaken had to be cancelled because of political pressures. Still, for a while, these projects provided work for many people, and helped to improve the economy.

In 1948 the communist government of Hungary ordered the nationalization of all industries employing more than one hundred persons. Consulting engineers, unable to continue in private practice, had to give up engineering, emigrate, or join one of the government agencies. The great majority of engineers, who stayed in Hungary because of personal attachments, eventually accepted such opportunities as existed for them in the bureaus.

It has been asked how the government could run the newly-organized bureaus efficiently, with employees reluctantly recruited, and with former competitors forced to work together. Because the Communists were anxious to complete industrial projects at the prescribed date, with a minimum of expense, they made many concessions to the engineers. Engineers could refuse to become involved politically, and continue their work in new positions as public servants.

The Communist Party was outlawed in Hungary in 1919, and by the time the Russians occupied the country in 1945, most people were not familiar with it. Thus, many, including some engineers, joined the party only in order to advance further in their profession.

Government Engineering Bureaus

New government consulting bureaus sprang up, and were in control of all engineering by 1950. These were staffed, at the managerial level, by Party members or sympathizers, and the better-known architects and engineers who were not party members were given their own small departments. In this way, former consultants could continue to vie with each other through interoffice competitions. These competitions, between departments, squads, or individuals, were sponsored by the government

A REPORT FROM HUNGARY

to increase output, and bonuses were regularly given for surpassing set goals.

The bonuses were often an important part of the engineer's income, since a 15 percent or even a 30 percent bonus was not uncommon. They helped make up for the often inadequate salaries and the forced deductions for government bonds. In addition, emblems, citations, and other merit awards were given to promote the competitive spirit.

Each bureau was a self-sustaining operation, dependent upon its own contracts. At first, the old private practice fee schedules were used. Later, instead of a percentage basis, fees were computed according to the size of the structure in cubic yards, taking into consideration the type of building and structural methods used. This seemed to result in smaller fees for the bureaus, but they continued to operate on a profitable basis. Most of the profit went to the government, some was used for the bureau itself, and the rest was used for worker benefits — such as lakeshore guest houses where they could spend their vacations.

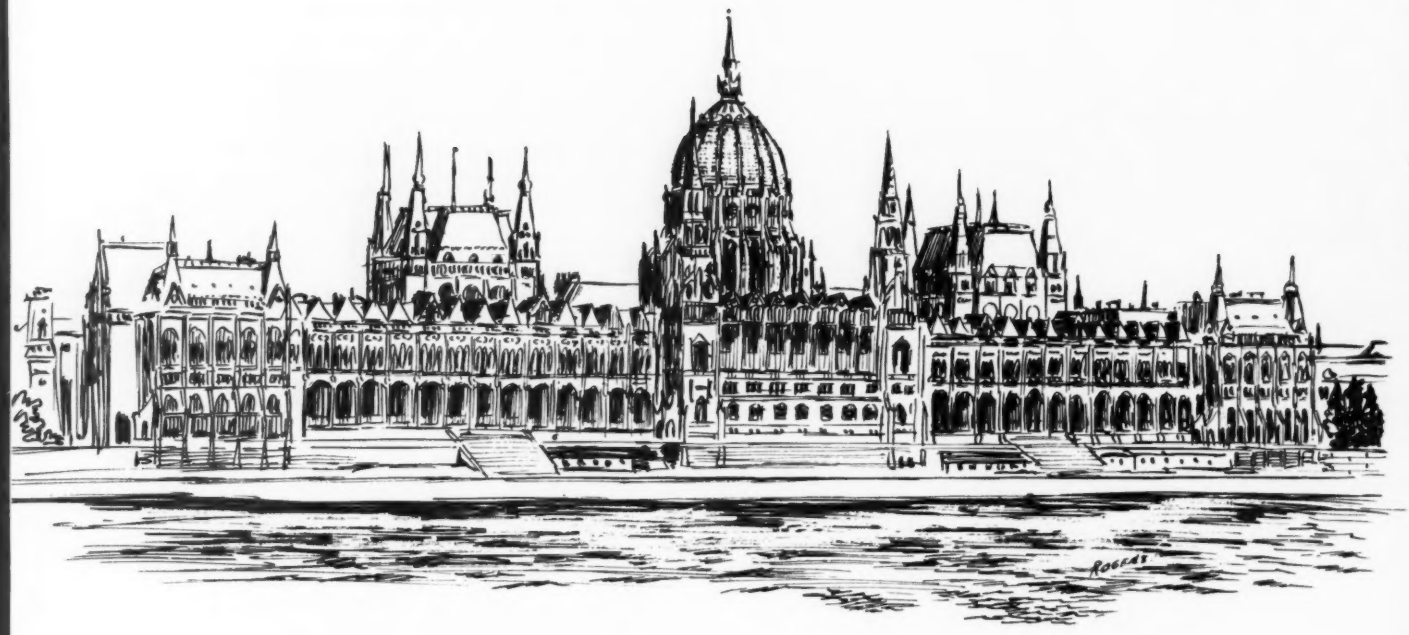
Personnel Management

In the early stages of nationalization, hiring for the bureaus was done by the director of each group. When a firm organizational form was established, all recruiting was done by a personnel manager — although senior technicians were picked at the discretion of the director. Fortunately for the former consultants and the better young engineers, a clannish professional attitude remained. It was strengthened by the fact that almost all engineers had graduated from Hungary's one technical university.

All employees enjoyed a yearly two-week paid vacation, usually spent at low-cost government hotels. Sick leave was paid for by the government health insurance plan. More recently, a new pension plan was set up, but since it was subject to tenure, and there was a continuous demand for engineers, few became eligible. Most of the older engineers in Hungary are still in active service.

Immediately after the Second World War, professional engineers enjoyed an exalted status in Hungary, and by 1947 were earning more than doctors. In 1956, the doctors, still permitted their private practice, were back on top. The wage level in any of the countries behind the Iron Curtain is difficult to evaluate in Western terms because of the different buying power of money and the controlled consumer market. But Hungarian engineers, among the better paid personnel in the country, still did not make as much as their colleagues in Austria or Czechoslavakia.

Consulting engineers, together with all other employees of the bureau's technical, clerical, and



manual groups, became members of the nation's building trade union. Engineers were generally considered a necessary and important part of the construction union, although in earlier days a certain controversy was evident between consulting and construction branches. The government expressed a political preference for the construction group, and any backlog, sloppiness, or other trouble on a job was pictured as the fault of the engineer. All this was played up by the papers, and only careful records kept by architects and engineers saved them from being accused of mismanagement or sabotage.

Structure of the Bureaus

One bureau, which started out in 1949 with about 100 employees, eventually was organized into a city planning department and an architectural department. By 1956 it had grown to 500 employees, with one city planning and three architectural-engineering departments; an estimating and construction department; the usual management groups such as personnel, security, accounting, attorney, budgeting, and party secretariat; auxiliary technical services; and car pool.

The estimating and planning department of this bureau had to estimate all items in specifications according to the cost analyses prepared by the Ministry of Works, and see that the necessary equipment was scheduled for the job site. The same department was responsible also for safety planning. The Hungarian labor law is very strict in this regard, and this placed an unusually stiff burden on the bureau. If an accident occurred, the first question raised was whether there had been any omission in the safety precautions.

Fines and Penalties

American engineers may find it strange that there was a position for an attorney on the bureau. This was necessitated by the contract form of obtaining jobs, and the fines and penalties system connected with schedule and performance.

Both the designer and the builder knew in advance that fines would be imposed on them for tardy completion, unless they were able to prove some major cause or fault by another party. Therefore, right from the date of bidding — when the contractor is assigned to a particular job by his ministerial department — there is a fight to see that someone else will be blamed for any trouble.

Before an umpire system was set up for industrial contracts, the contractor was assumed responsible for any unsatisfactory performance unless he could prove conclusively that it was the fault of a subcontractor or a mistake in the specifications. Under the umpire system, a third party determined the blame in cases of unsatisfactory completion of a project. Most of the time the penalty or fine was bound percentage-wise to the contracted sum, and was not excessive. However, an unfavorable decision by an umpire could open the way for damage suits and disciplinary action.

Technical Training

The former Royal Hungarian Technical University was divided into technical and construction di-

visions, with the technical branch patterned on the Swiss Polytechnic Institute at Zurich. In addition, universities specializing in chemical, metallurgical, and railroad engineering were founded separately. In Hungary, engineering is a 9-semester curriculum, with the degree of Diploma-Engineer equivalent to a Master's Degree in the United States. This degree is given in civil, mechanical, chemical, architectural, metallurgical, and mining engineering. There is no equivalent of a Bachelor's degree; the advanced degrees of Candidate and Doctor of Science both require research and original dissertations. As is common in other Communist countries, women are encouraged to take up engineering, and have entered every branch.

The shortage of professional engineers led to large-scale acceptance of untrained personnel, who were given on-the-job training, and were encouraged to go to night school. These night school students, and many women who proved themselves competent in drafting, detail, and design work, have left the trained engineers free to handle more demanding duties. As more money, and more scholarships became available, night school students changed to day studies, and the importance and value of the night school diploma was considerably diminished.

Construction Industry

The whole construction industry, with the exception of about half a dozen contractors, has also been nationalized and grouped in big companies, each serving a special field. The bulk of the construction industry is handled by the Ministry of Transportation, including bridges, highways, railroads, and airports. The Ministry of Construction handles industrial and commercial development and housing.

The introduction of mass production methods and newly recruited labor led to a lowering of the prewar standards of craftsmanship among the workers in the construction trades. This lasted, however, only until the initial quantity requirements were met. After that, the government raised standards to their earlier levels, and the quality of work is once more up to prewar standards. ▲▲

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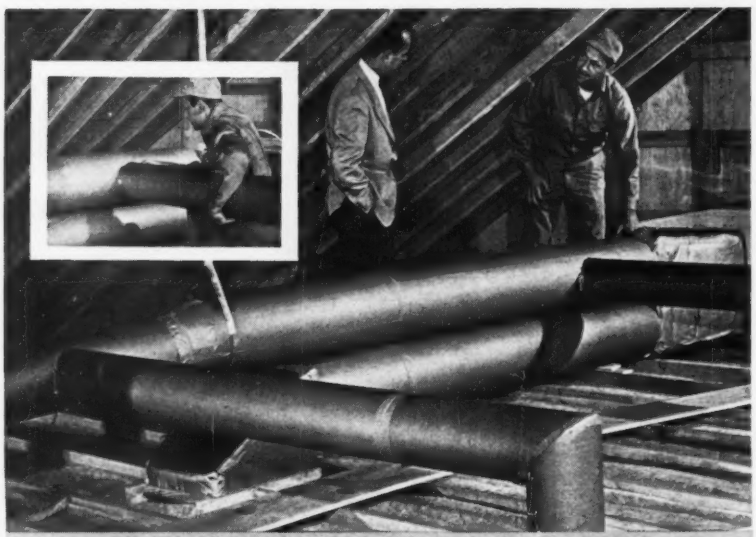

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A Way to Make Them Talk

EUGENE RAUDSEPP
Psychological Research Consultant
Deutsch & Shea, Inc.

THE NONDIRECTIVE INTERVIEW is an interview in which very little attempt is made to direct the applicant's conversation. He is encouraged to talk without constraint. A leisurely conversational manner characterizes the interview, and the interviewer adopts an interested, listening attitude which encourages and stimulates free expression on the part of the applicant.

The nondirective approach offers several advantages. One significant advantage is that it tends to put the applicant at ease from the start. The free and permissive atmosphere, in which the applicant feels accepted without reservation, allows him to talk about subjects that he considers important and interesting at the time, and which, in his experience, seem appropriate. Consequently he is apt to reveal his true interests and attitudes and something of his emotional background. The nondirective method also permits the establishment of rapport between the applicant and the interviewer, and the applicant tends to reveal much about himself that he otherwise would hesitate to discuss. The more he talks, the more his deeper lying attitudes and interests emerge.

The nondirective interviewer follows no fixed schedule of questions. Rather, he endeavors to encourage his applicant to speak freely and naturally. He uses questions only to follow up promising leads. He analyzes the conversation as it proceeds and redirects the applicant's line of thought where the clues are most promising.

The interviewer could start by saying, "We are interested, as we assume you are, in finding you a position for which you are suited. Instead of my asking you a lot of questions, you tell me the story of your background and experience." Then, the interviewer must learn to subordinate his eagerness to get at the facts he needs to know.

Job Descriptions

A regular program of job analysis is necessary to effective interviewing. This list of specifications should identify all the important features of the operations involved in the job, the working conditions, qualifications that have to be met by the applicant, the training period, and opportunity for advancement. The specifications should indicate the educational requirements, previous experience and training needed, and special abilities the applicant must have.

The job specification also should include essential facts about the nature of the organization — its policies, hours, medical provisions, opportuni-

ties for advancement, and special fringe benefits. If these are all in writing on the interviewer's desk, they can be injected into the conversation from time to time. This will help the applicant to decide whether he wants to accept the position.

Careful preparation of the job specifications, especially for the more important positions, and a a conscientious use of them in interviews will reduce the errors in selection. Experience has indicated that more errors in selection based on interviews are due to lack of familiarity with job requirements than to any other cause. It is important that the interviewer be able to answer the following questions:

¶ What are the essential duties of the position?
¶ Which of these are the most difficult and why?
¶ Which of these duties involve the greatest personal responsibility?
¶ What kind of responsibility is involved?
¶ What are the supervisory responsibilities?
¶ What are the personal hardships and discomforts?
¶ What are the attractive features of the position?

It is desirable that the interviewer keep the written job specification before him during the interview. Then, having in mind the image of a model candidate who possesses all the personal qualities required for the position, he can compare the actual applicant with the desirable image.

Often, an applicant can be given a preliminary evaluation in terms of the job specification before he comes in for the interview. Not only does this save time, but it also permits planning around any topics that need special attention. And the more the interviewer knows about the applicant, the more he will be in a position to concentrate on those things he does not know, resulting in a more accurate and complete final appraisal. It is especially helpful to talk with several of the applicant's references prior to the interview. They may suggest important areas for special probing.

Establishing the Atmosphere

The interviewer should always see to it that the prevailing atmosphere of the interview is cordial. The individuality of the applicant should be respected so that his self-confidence and self-esteem are not destroyed. A friendly and interested attitude and acceptance of the applicant's ideas without moral judgment will aid the interviewer in understanding the personality of the potential employee. Many applicants will respond strongly to any suggestion of blame, criticism, or disapproval. Conversely, frequent expressions of unqualified approval are apt to be resented by an intelligent applicant.

The interviewer should accept the applicant as a conversational and intellectual equal during the interview, taking care not to talk down to him. He should be objective and not become emotionally involved.

Using all these techniques, together with patience, the interviewer should be able to gather enough information to formulate an honest judgment of the applicant's ability – unbiased by irrelevant considerations.

Setting Up the Interview

The effects of the physical environment of the interview are frequently underestimated even by experienced interviewers. Place, time, and circumstance may exert an influence which no amount of interviewing skill can alter. There should be ample and comfortable space provided for the meeting, preferably in an enclosed room or one which implies an atmosphere of privacy. Freedom from interruptions and distractions is necessary so that both parties can concentrate on the interview. A telephone call or a visit can induce a state of retrospective amnesia that prevents a smooth and logical continuance of the thread of conversation. The presence of a third party usually has a very bad effect on an interview.

The applicant should be seated so that his whole person is visible to the interviewer. Body movements and posture may provide important clues to personality, particularly since most applicants are rather nervous and apprehensive at the beginning of an interview. Informal conversation on a subject of general interest will be of help at this point in putting the applicant at ease.

Establishing Rapport

The interviewer should not only be a sympathetic listener, he also must be able to adopt temporarily the attitudes of the applicant. This requires a tolerance of other's beliefs, standards of value, and taste. The interviewer must keep in mind that he is

not engaged in a debate, nor is he there to educate or inform the applicant. The purpose of the interview is to find out how the applicant thinks and

feels — not to reorient his political opinions or his moral standards.

Rapport must be established and then maintained throughout the conversation. One excellent technique is to assume an attitude of mild agreement. Seriousness and earnestness are essential. Nothing causes a man to shut up faster than flippancy. With apprehensive or overly sensitive applicants, the adoption of a formal attitude may act as a palliative. Subtle changes of topic, attitude, and tempo will help when there is an impasse. All of this comes to the interviewer as the result of study and experience.

Observations During the Interview

Throughout the interview the interviewer must observe the applicant carefully, noting not only what he says but the manner in which he says it. Every interview has its nonverbal evidence of emotions indicated by changes in facial expression, movements of the body, muscular tensions, fluctuations in the quality and volume of the voice, volubility, and silence. These clues should be weighed with care for they often provoke in the interviewer unreasonable likes and dislikes.

A strong initial impression can prejudice the interviewer through what is known as the halo effect. This is the tendency to classify a person as good or bad and then to rate him on all traits in keeping with this preconceived opinion. To guard against the halo effect, its existence must be recognized. Then, if the reasons for each rating made during the interview are jotted down, they can be objectively evaluated after the applicant has left.

There are also special personal prejudices that can influence the interviewer. He may simply dislike men who wear tie clips, but he must understand that this is an unreasonable prejudice and he must weigh it for what it is worth — not letting it overbalance more important factors.

The Art of Questioning

The technique of questioning is the very heart of the interview. Questioning starts the applicant talking and elicits from him the essential facts — even in the nondirective interview. Questions must be used to fill in details that do not come out in free narrative. Properly injected, questions can steer aimless conversation back to pertinent topics. When attempting to secure information through questions, it is essential that the person being questioned understands what he is being asked. Perfection in this regard can never be achieved, but insofar as possible the interviewer must be sure that his terms are known to the applicant and that they carry the meaning intended. Semantics is no simple subject, and it cannot be expected that interviewers be experts in this difficult study, but some knowledge of the meaning of words is essential to successful interviewing. When there is some doubt as to meaning, it is wise to repeat the question, using different words, and substituting well known synonyms.

Too many interviewers are guilty of suggesting the answer by the way they phrase a question. ("How do you feel about the way the unions are muscling into the building trades?") While a skillful injection of a suggestion into a question may occasionally bring out true feelings, most suggestions do harm, especially with the applicant who is eager for the job and trying to give acceptable answers. If, under these conditions, the applicant thinks he knows what answer is desired, he may try to give it.

A good interviewer asks no more than one question at a time. He is careful to start with questions least likely to produce a withdrawal, and questions requiring an unqualified "yes" or "no" are avoided, for they restrict further comment and do not permit the applicant to enlarge upon his answers. It is better to ask questions that call for narrative statements in response. Each answer may contain significant leads to other questions, and the interviewer should watch for these hints. Instead of a direct question, some interviewers find that an occasional "and then?" stimulates the applicant to continue his recital.

Encouragement should be given to the applicant to ask questions about the work and working conditions. Many interviewers assume the incorrect attitude that an applicant who asks questions may be too choosy and might turn out to be a troublemaker. While any excesses should be examined, an applicant has a right to know all about the position and the firm for which he intends to work.

While formality is foreign to the nature of the nondirective interview, the opposite extreme is also to be avoided. It is an error to conduct an interview at the level of polite social conversation. The interviewer must retain control of the situation. He must recognize that his primary duty is to help the applicant express what is in his mind. Then, the observation of the type of topic that intrudes recurrently when the applicant is allowed to have initiative will afford valuable clues.

Recording the Interview

Some experts on interviewing have suggested that an immediate record be made of all the applicant

says. They point out that this preserves the data accurately. Others have taken issue with this and feel that on the spot note taking has more shortcomings than advantages. It is true that copious note taking gives the whole interview the tone of a cross-examination. When an applicant tells the interviewer about his personal affairs, the immediate recording of this information may put a quick stop to further revelations. There are also applicants who stop talking while the interviewer is writing for fear of interrupting him in his efforts. There are others who continue to talk, but their manner becomes hesitant and disjointed, indicating that they are in doubt as to whether they should talk or shut up.

However, note taking is not entirely a negative action. If properly handled, it can assure the applicant that his comments are important enough to record, and a thoughtful interviewer can avoid most of the bad aspects if he is conscious of them and watches out for them. Admittedly, this takes skill, and for this reason most interviewers feel that the bad aspects outweigh the good. Therefore, it is generally recommended that interviewers record their impressions immediately after the applicant leaves and before the next interview is started. This assures fairly accurate records, with improved objectivity because the applicant is no longer on the scene to influence the interviewer's attitude.

Terminating the Interview

On the whole it has been found that nondirective interviews take more time than the direct question and answer type. However, no time limit should be imposed. A good interviewer intuitively knows when to close an interview. The applicant is sent off when the interviewer has found a sound basis for either disqualifying the applicant, deciding that he can handle the job, or knowing that he has at hand all the information needed to make a decision later. If no decision is made at the moment, the applicant should be advised when to return or when he will be notified by mail. Whatever the outcome of the interview, the applicant should be sent away with a handshake and a smile.

Return Matches

A second interview is frequently advisable. Often, important factors overlooked in the first are observed during the second interview. In addition, the ordinary process of getting to know a person demands several encounters. Few applicants will go beyond a certain point in displaying their attitudes and feelings at their first meeting with a prospective employer.

On the other hand, it may be worthwhile when an important job is being filled to use a different interviewer for the second meeting. The fact that the estimates of the two interviewers are not identical does not indicate an error in judgment. The two different interviewers will simply have noted different aspects and qualifications in the same applicant. Thus, the pooled estimates of the two will add to the accuracy and completeness of the final evaluation.

Evaluation and Appraisal

Ideally, the interview should terminate with sufficient data provided to reveal the applicant's mentality, attitude, skill, training, experience, and physical makeup. It should also show whether his personality is in keeping with the demands of the job and whether the applicant is genuinely interested in the type of work available. These last two points are important, for personality faults and lack of interest can disrupt an entire group.

Before deciding on the acceptability of the applicant, the interviewer should have a clear picture of the particular traits or qualifications needed for satisfactory performance. Making the final decision involves a weighing of the total rating of the applicant against the position and deciding whether he is qualified to fill it. Extreme care is required at this point, for the interviewer must maintain a detached attitude in his final appraisal of the candidate's qualifications.

Interview rating scales have been developed to facilitate recording of impressions of a candidate. While helpful, they can only furnish a compact medium for expressing the interviewer's judgment. They should not be looked upon as a testing device. The rating scale's main function is to focus attention on essential characteristics to insure their careful appraisal. They provide no means for measuring small differences of personality.

After recording the essential data, the interviewer makes a written qualitative appraisal of such factors as approach, conduct, appearance, attitude, personality, organization of facts, fluency of presentation, and confidence in self. These must be rated as weak, fair, average, or strong. Examples must be given to support the decision made.

The result of this careful approach to nondirective interviews will be a rapid improvement in the skill of the interviewer and in his abilty to judge men and jobs and put them together properly. The result will be greater personnel efficiency within the firm and a healthy reduction in the nonproductive expenses of hiring and firing. ▲▲

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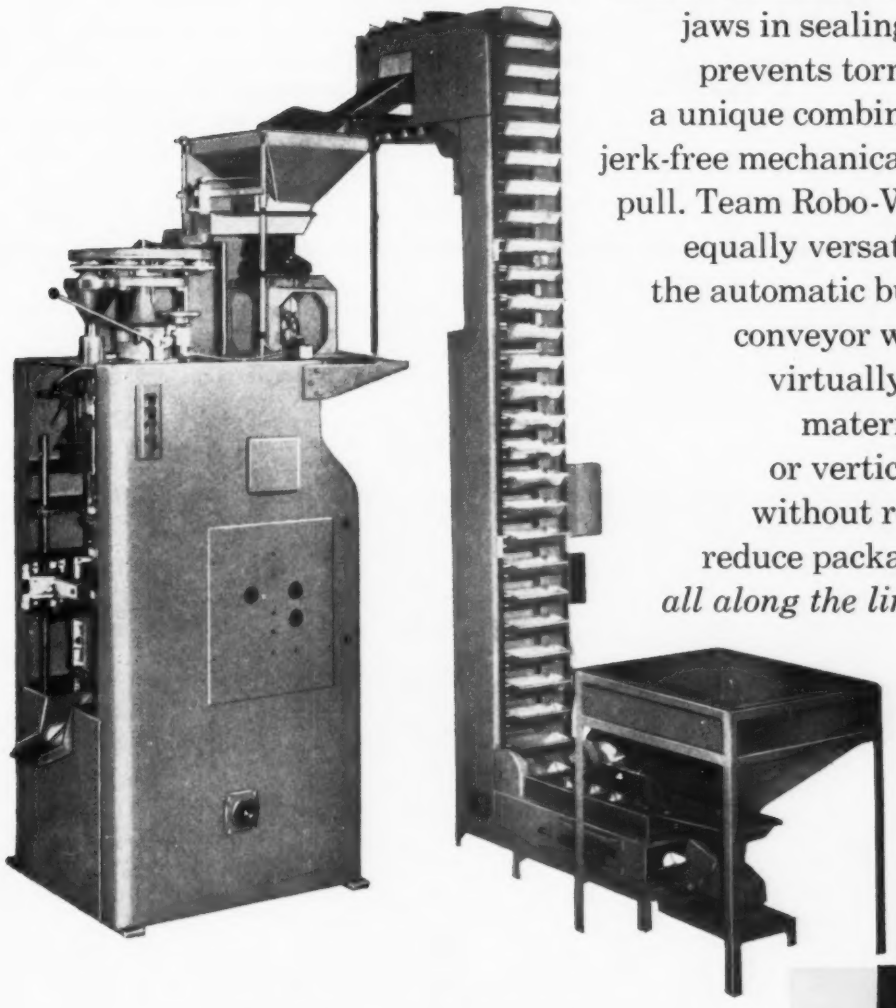

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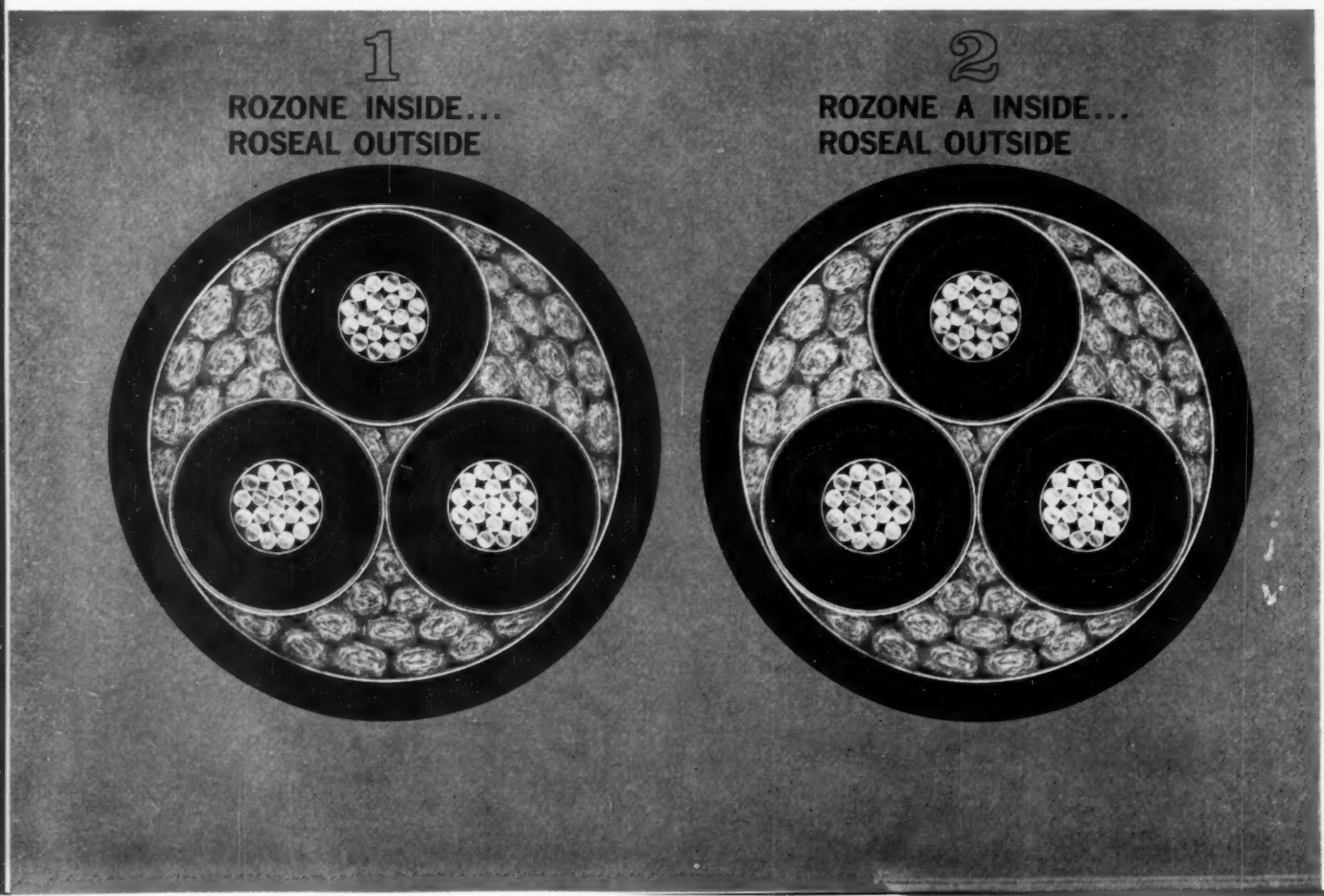

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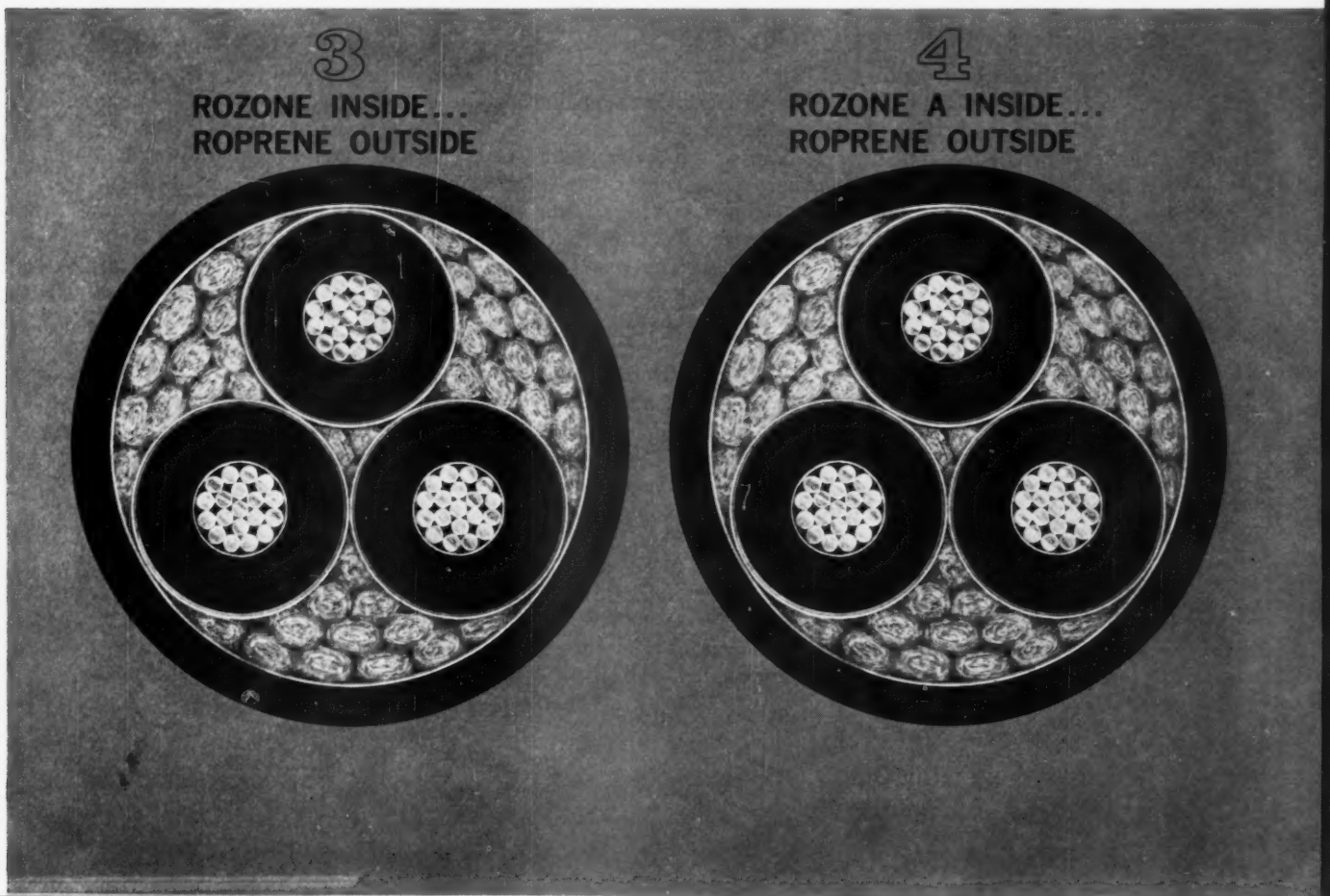
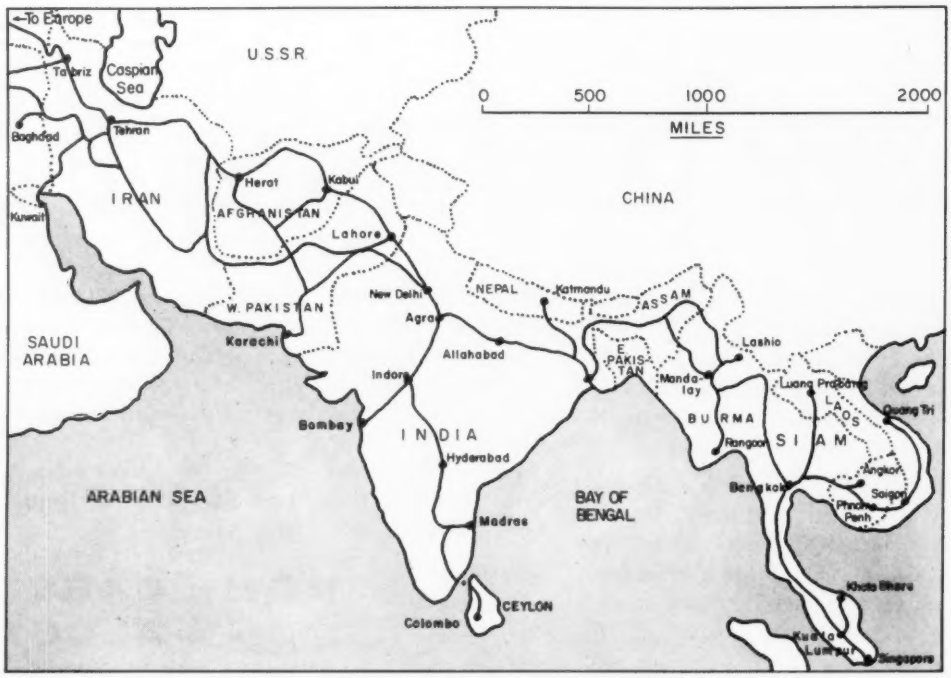




Map showing the network of roads planned for inclusion in the 21,500 mile Pan-Asian Highway currently being studied by the United Nations Economic Commission for Asia and the Far East.

Planning the Pan-Asian Highway

ALTHOUGH ASIA contained the great trading routes of the ancient world, it is today the most backward continent in the world as far as highways are concerned. Indeed, the poor condition of its existing highways, and in particular the lack of trans-frontier connections, is one of the principal reasons why economic progress has failed to keep pace with the Continent's huge increase in population. And the same can be said of Asia's other transportation systems.

Apart from the large railroad systems of India and Pakistan, there are very few international railroads in southern Asia, and the existing ones are quite inadequate for today's needs. Since World War II civil aviation has been the chief means of linking these eastern countries. But air travel by itself cannot possibly solve the fundamental problems of transport. It is, in any case, far beyond the means of the vast majority of the peoples of southern Asia. Therefore, another solution is needed.

ECAFE Looks Ahead

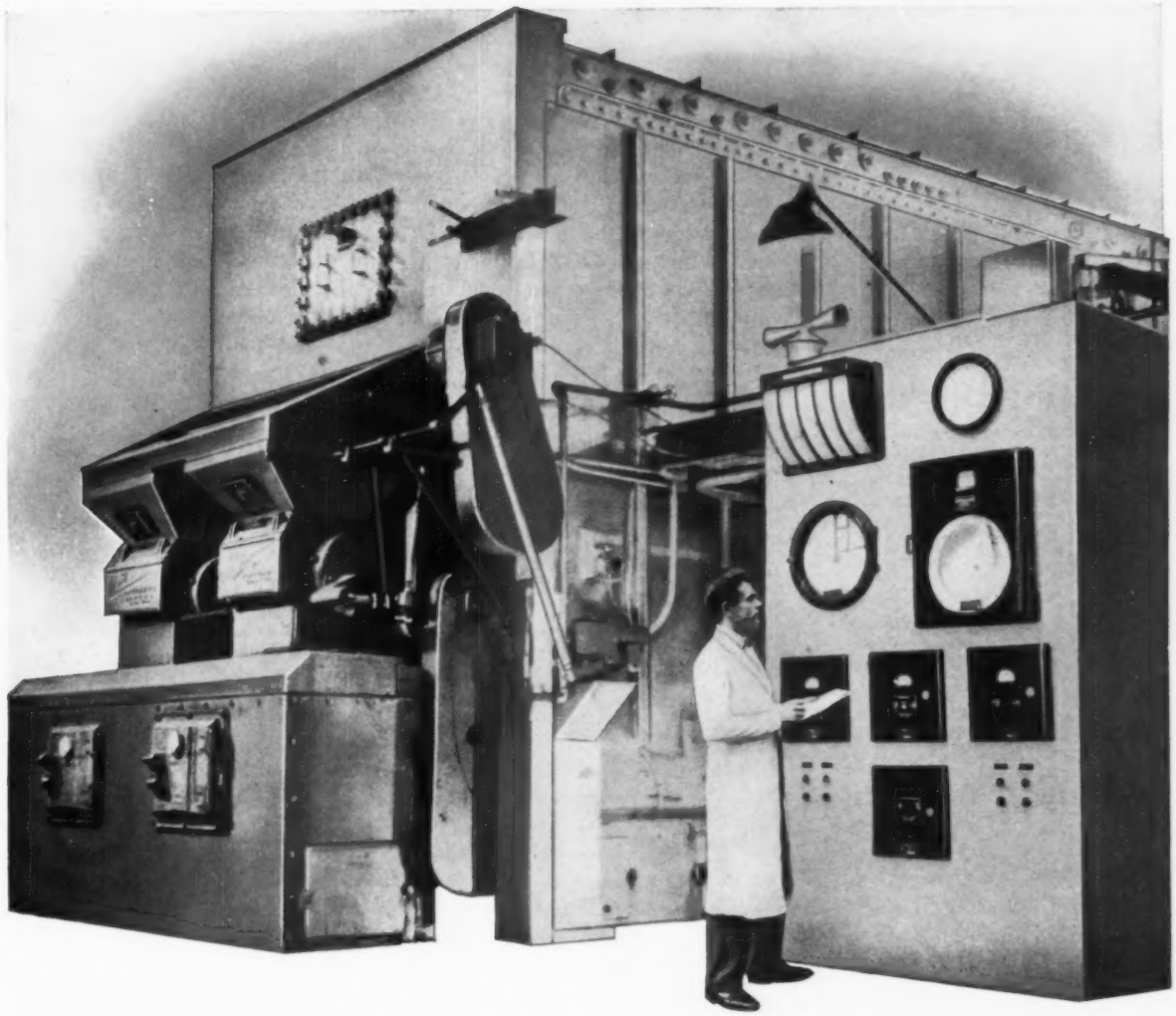
Within the past year or so, however, practical discussions and studies have been taking place on a bold project to provide this vast region with an up-to-date international highway system on the same lines as the Pan-American Highway system. The plan was conceived and has been approved by the United Nations Economic Commission for Asia and the Far East (ECAFE), of which all the countries in the region, as well as Australia, New Zealand, and Britain, are members.

In view of the immense social and economic problems in that part of the world, the Pan-Asian highway proposal must be regarded as one of the most far-reaching ever made for promoting basic development and trade, and consequently raising the living standards of millions, through an international transportation system.

At important meetings of ECAFE's working groups on international highways, held at Bangkok, New Delhi, and Karachi in recent months, the representatives agreed, subject to approval of their respective governments, on the routes to be included in the Pan-Asian Highway scheme. The Highway will not be just a single ribbon of road, but an integrated network of international routes totaling more than 21,500 miles.

Huge Network Envisioned

The plan is to link up with the European highways system on the Turkish frontier and to construct a highway to join Ankara with Teheran, the Iranian capital. From there, Teheran will be joined with Singapore and Saigon through Kabul, Lahore, New Delhi, Mandalay, and Bangkok, with links on the way to Karachi, Bombay, Madras, Co-



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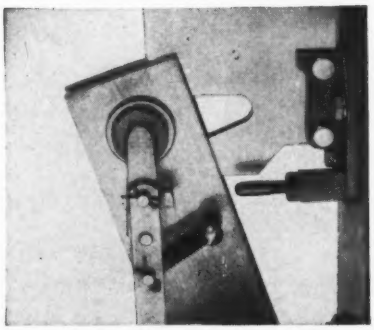

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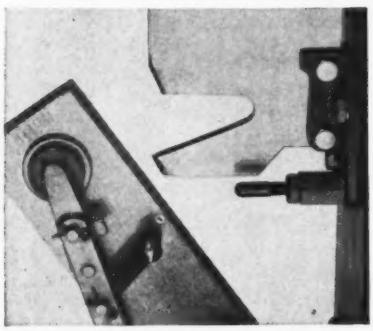

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These international routes should form the most direct links between the various capitals, principal seaports, and trade and tourist centers, and provide the necessary connections for land-locked countries. Many of the ancient caravan routes that once linked India and China with Europe, but which fell into disuse as a result of widespread political and frontier changes, would be modernized and incorporated into the new Pan-Asian Highway.

Will Aid Economic Growth

Reference to the map will show how important the Asian Highway could be to the Asian members of the British Commonwealth. India, East and West Pakistan, Ceylon, the Federation of Malaya, and Singapore would absorb more than half of the entire network between them. In addition to the unlimited opportunities for trade opened up between these countries themselves, and with their neighbors, the resulting closer unity of the countries of southern Asia would help to maintain and even extend Western influence throughout a region where there is ever increasing communist pressure from the north and east. The long-established sea and air routes between South-East Asia and Europe would be powerfully reinforced by motorized land routes all the way from Singapore to the capital cities of Western European nations.

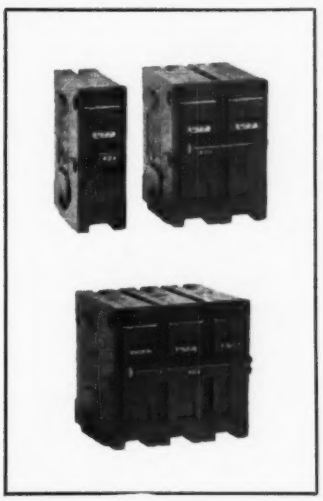
From the other side of the world, Australia's growing trade and other connections with South-East Asia might be greatly extended once an international transport system on the continent materialized. Australia's natural markets lie in this region, and in the past few years she has concluded co-operative trading agreements with quite a number of south Asian and Far Eastern countries.

In many ways the Pan-Asian Highway could help to develop the economies of the various countries of the region. For example, Malaya's natural products — especially rubber and tin — are greatly needed by other Asian countries with which adequate land routes are at present lacking. Feeder routes from the Highway through India and Pakistan could help considerably in brining new areas under cultivation to meet both of these countries' urgent needs for increased food production. There would also be benefits for Asia's new industries. For example, when India's new national steel plants are in full operation there will be steel available for export to her neighbors. The Highway would provide a ready and economical route for the shipment of this steel to an existing market.

Nor must the great possibilities for tourism be overlooked. The establishment of a modern motor route from Europe to South-East Asia would open up exciting new vistas for the travel-minded Westerner and immense scope for a mass tourist trade in India, Pakistan, and other countries. It would be comparable to that now flourishing throughout Western Europe and the Mediterranean area. Already, the overland route to India has been pioneered with motor coaches from England, offering relatively low cost travel.

Program Began in 1955

The first steps toward the Pan-Asian Highway plan were taken five years ago, at the 1955 meeting of ECAFE's Highway subcommittee in Manila. On the advice of the delegates present, the ECAFE secretariat began a detailed study of the twin problems of how to improve the region's existing land communications and the means whereby highway links between countries could best be developed. Subsequent discussions and study tours have carried the plan forward, and definite route agreements emerged from the latest meeting of the working groups.



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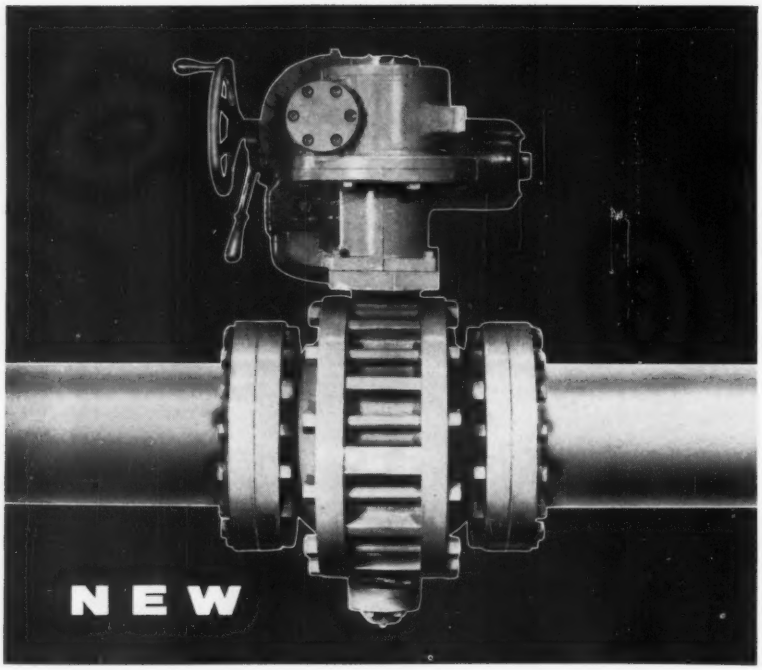

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more meetings are being held this fall and in 1961, and there is promise of continued progress.

So vast are the distances and so varied the problems of terrain, climate, and soil foundations, over the route of the Highway, that the sub-committee decided it would be necessary to divide up the whole region into three zones or groups of neighboring countries. Each zone has its own headquarters, where the working groups of experts will meet at regular intervals for taking co-operative action on technical, financial, and other problems. This organizational approach should help to quickly resolve major areas of conflict.

The western zone is concerned with the international links from the Turkish frontier through Iran, Afghanistan, and West Pakistan. Its meeting place is Karachi. The center zone covers routes in India, Ceylon, East Pakistan, Nepal, and the linking up with the system being planned for the western zone in West Pakistan and with the countries and states of South-East Asia, including Burma, Malaya, Thailand, Laos, Cambodia, Vietnam, and Singapore. Its meeting place is in Bangkok.

The main preliminary task is to provide a number of essential highway links, chiefly in South-East Asia, where at present there are no roads existing at all. The condition of many other stretches of the route is such that they are quite unfit for all-year auto and truck traffic. Bridges are badly needed in many countries or, alternatively, the establishment of efficient motor ferry services. It has, therefore, been agreed to include in the proposed standards for international highways and bridges, the minimum level to which the existing roads must be up-graded. This upgrading will be achieved by stages as traffic grows and funds permit.

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lected from all the countries concerned, by means of a questionnaire circulated by the ECAFE secretariat, on the current deficiencies of all routes included in the planned network. This information will allow the establishment of logical priorities when work begins.

To ensure smooth flow of traffic and unhampered trade, once the Highway is opened, it is proposed to simplify the customs and frontier procedures everywhere. This matter is being actively studied, since many obsolete traditions still hinder travel across Asian frontiers. If not removed, they would completely frustrate the economic purposes of the Highway, and could result in the complete failure of the plan.

Financing and Engineering

Naturally the question of financing such a project as the Pan-Asian Highway is immensely important, and it is clear that very substantial outside help will be required. It will be sought from such international agencies as the World Bank, the United Nations Special Fund, and the British Commonwealth's Colombo Plan. It is also evident that engineering assistance will be needed, since most of the countries involved are only just now beginning to establish their own highway departments. (See CONSULTING ENGINEER, "What the Bureau Is Doing Abroad," October, 1960.)

Since international highways are a certain key to future prosperity and stability, the scale of the Pan-Asian Highway should result in very widespread benefits that would surely make it a most rewarding investment. It is, indeed, one of the greatest contributions that could be made at this time towards the development of a region containing more than one quarter of the entire population of the world and the potential resources sufficient to give them a reasonable standard of liing. It is a truly historic concept. ▲▲

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Flexibility of Design

RCA's Modular Sound Control System assemblies are mounted on 19 inch panels and stocked as standard units.

Planning and specifying an RCA system is greatly simplified—merely requires determining the functions to be accomplished by the sound system and selecting the standard assemblies and cabinet which best match the requirements. The specified elements are prewired with plug-in connections; are custom assembled by factory experts, and shipped ready for installation. Once one of these flexible systems is installed, the modular-construction concept makes later expansion easy. Service, too, and parts replacement become greatly simplified.

Simple to Operate

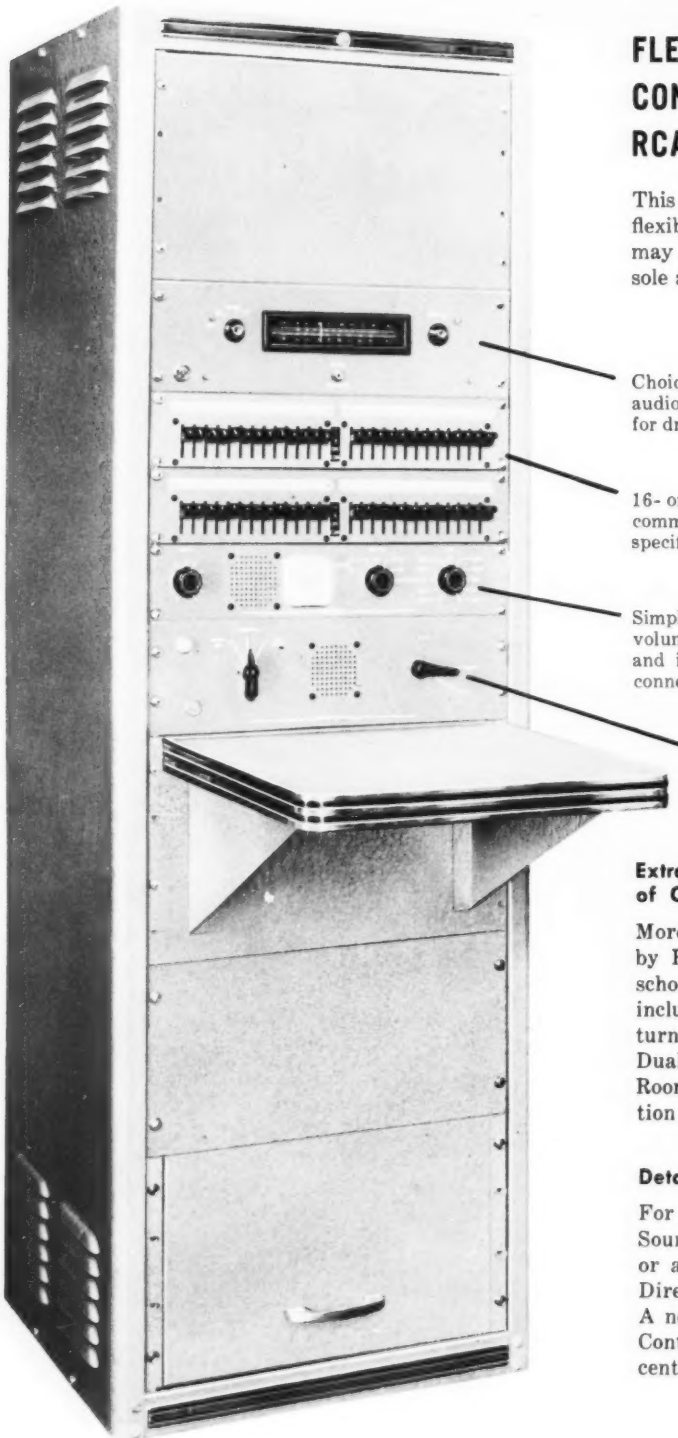
Simple operation combined with flexibility are characteristic of RCA's modular design. The number of operating controls, switches and knobs have been reduced to essentials without detracting in any way from the functions of the system. The program panel, for example, has only three controls. The intercom panel is equally simple and incorporates a combination monitor-loudspeaker and microphone. It also features RCA's single "ALL-CALL" switch that instantly connects all loudspeaker locations for emergency announcements.

Easy to Install and Maintain

Reliable performance at lower cost is an inherent advantage of these new systems. Installation is readily accomplished, since the systems are shipped with all units mounted in place. Before leavingthe factory, the individual assemblies are tested and the entire system is checked out to meet RCA's rigid quality standards. Components are readily accessible for service and parts replacement.

Assemblies for RCA Modular Sound Systems are illustrated and briefly described on the next page.

AUDIO NEWS for consulting engineers



FLEXIBILITY AND OPERATING CONVENIENCE KEY FEATURES OF RCA MODULAR SOUND SYSTEMS

This rack mounted RCA Sound System illustrates the flexibility and convenience of modular design. Elements may be varied in location in this rack or in the desk, console and turret cabinets also available.

Choice of standard or deluxe AM-FM Tuner . . . extended audio-frequency range . . . extreme sensitivity . . . AFC position for drift-free reception.

16- or 26-key switchbank panels for controlling program and communication available. As many panels as needed can be specified. Optional light annunciators.

Simplified program panel contains only three control knobs: volume control, monitor selector switch to control distribution and input selector. All cabling terminates in plugs for easy connection.

Intercom panel includes a talk-listen switch and one for intercom — all-call selection. Monitor microphone built into the panel—separate mike not required.

Extra Versatility Afforded by Wide Range of Components

More than 500 individual audio products are offered by RCA to make this extra versatility possible. For school systems, frequently specified sound facilities include: Automatic 4-speed Record Player (manual turntable provided with basic systems); High Fidelity Dual Track Tape Deck; Microphone Mixer Panel; Room Privacy Switches; Telephone Intercommunication facility.

Detailed Information Available at Your Request

For information and specifications on New Modular Sound Systems and their assemblies, write to RCA or ask your Sound Distributor. He's in the classified Directory under "Public Address and Sound Systems". A new booklet, Select-a-Guide on RCA Modular Sound Control Systems, pictures and describes this flexible central sound equipment. Request Form 3J3668.

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If you specify underground hot pipe insulation, ask yourself this question:

What material and supplier offer the best assurance of efficient, maintenance-free installation?

Every engineer knows that his reputation depends upon planning projects that will assure the best performance for the lowest price. He also knows that the *initial* cost is not the *lowest* cost, if the job isn't designed to function efficiently over an extended period.

That's what makes the answer to the question posed in the headline of timely importance where underground hot pipe insulation is concerned.

The use of a central heating system to heat all buildings of a college, housing project, hospital or industrial plant can effect a notable saving in equipment and operational costs. But planning the underground piping for such systems involves many time-consuming problems. Proper insulation, prevention of corrosion and electrolysis, temperature and terrain conditions, and other factors require careful analysis before trenches are dug and pipes laid.

Now, for your honest appraisal and evaluation, we would like to tell you about GILSULATE and the extra benefits which you and your clients will derive from its use.

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GILSULATE is a naturally-occurring mineral which, because of its unique chemical and physical properties, is ideal for the insulation and protection of underground hot pipes and systems. It resists attack by acids and alkalies, is impervious to mold, rodents and plant growth, and is water-resistant.

The thermal efficiency, low installation cost and long service life of GILSULATE are supported, not alone by extensive laboratory and field research, but also by years of successful use in thousands of installations around the world.

What about Engineering Service?

American Gilsonite Company believes that good service is as important as the physical benefits of GILSULATE. It is as important to the company's reputation that the product be used properly, as it is for the engineer to assure his customer of an efficient, economical installation. That is why American Gilsonite Company provides these extra engineering services:

1. *Design Assistance*—American Gilsonite's carefully selected and franchised distributors all employ mechanical engineers with extensive experience in heating and air conditioning. They will work with you in preparing underground piping plans, checking soil conditions and arranging for supervision of the installation work.

2. *Approval of Plans*—Plans and specifications for all jobs should be checked by American Gilsonite's Engineering Dept. This cost-free service prevents trouble before a job is started.

3. *Supervised Installation*—Every GILSULATE installation of 30 tons or more is supervised by an American Gilsonite field service representative who stays on the job until it is completed. Smaller jobs are inspected by the distributor. This is an assurance to everyone concerned...owner, architect, engineer, mechanical contractor, and the materials supplier...that every step of the job will be exactly according to specification.

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The GILSULATE system of insulating and protecting underground hot pipes has been used successfully by federal, state and municipal governments, leading industries, utilities, hospitals, public housing, religious and educational institutions.

Without obligation, we will be pleased to send you technical information on GILSULATE insulation so you can evaluate the merits of this low-cost, poured-in-place material.

Ask to have your name put on the mailing list for PIPE INSULATION NEWS. The Summer 1960 issue tells how and why Caterpillar Tractor Co. used 2100 tons of GILSULATE in their Mossville, Ill., plant. Also, a story of how owner-conducted tests proved the superiority of GILSULATE over prefabricated conduit insulation.

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1. **Easy-to-use**—just pour, shovelpoint and tamp...pipe heat does the rest.
2. **Forms protection against heat loss** and all hazards commonly encountered by buried hot pipes.
3. **Needs no housing or mechanical sheaths:** no mixing, special handling or equipment.
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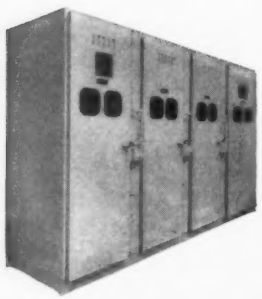

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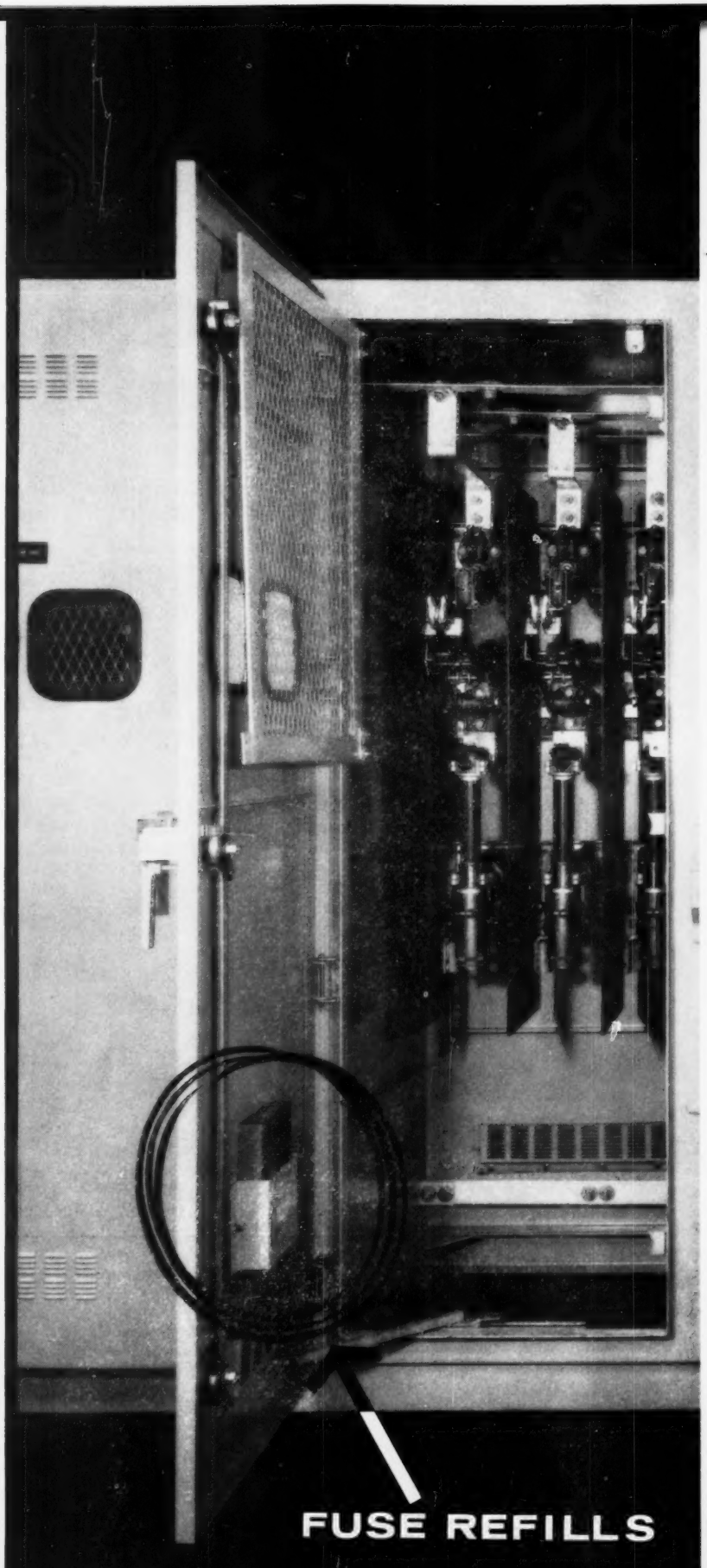

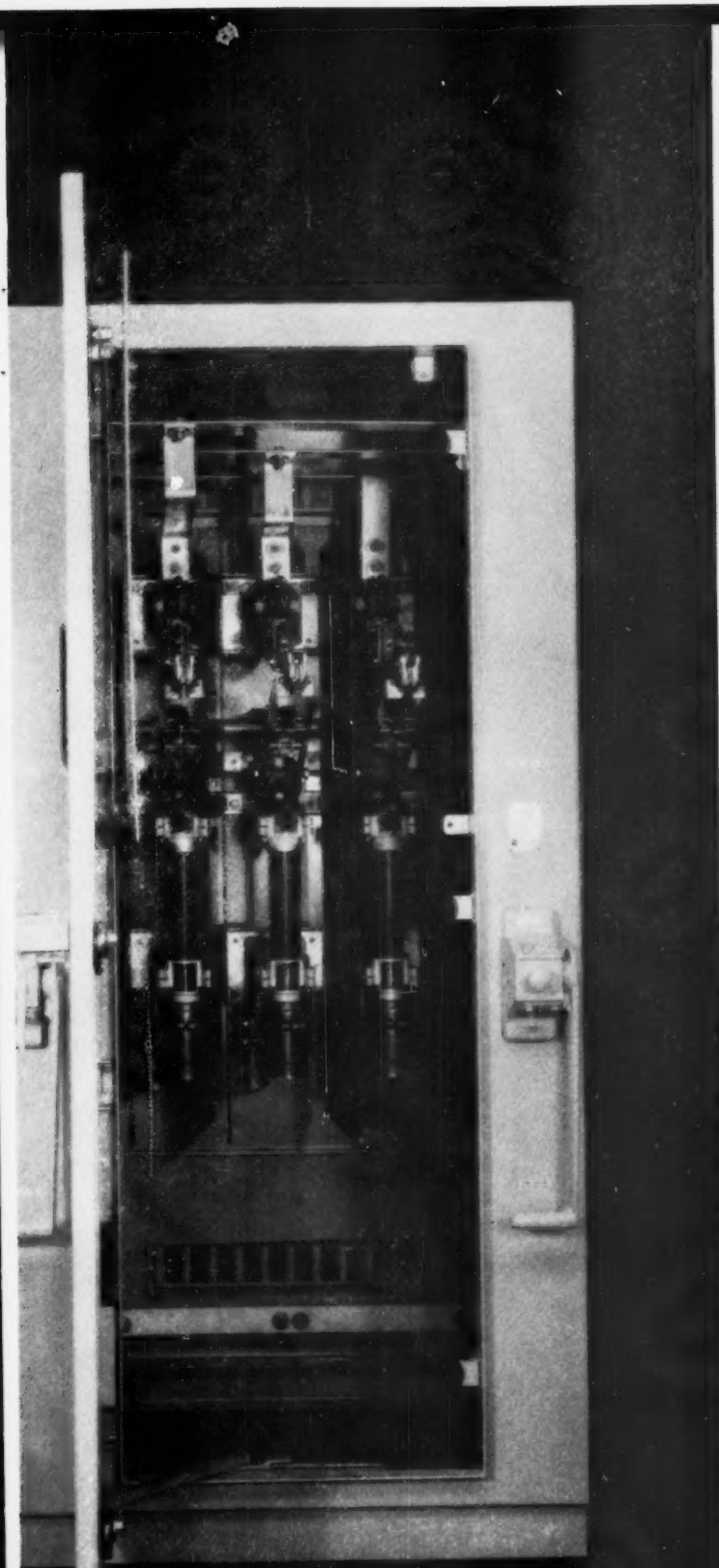

S&C metalclad switchgear is easy to operate, easy to maintain, easy to understand

The simplicity of the fused interrupters in S&C metalclad switchgear means that everyone from the consulting engineer to the electrical contractor to the plant engineer and electrician saves time, money, and effort. The power fuses give positive and permanently accurate protection against faults. The load interrupters provide full load switching and can close on any fault up to 60,000 amps (at 4.16 kv). The power fuse in series with the load interrupter takes the mystery and high cost out of high-voltage switch-gear for industrial plants and for commercial and industrial buildings.

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Operating instructions and installation are simple with S&C metalclad switchgear. Nothing to set, adjust, exercise or check out. Plant personnel find it easy to understand and operate.

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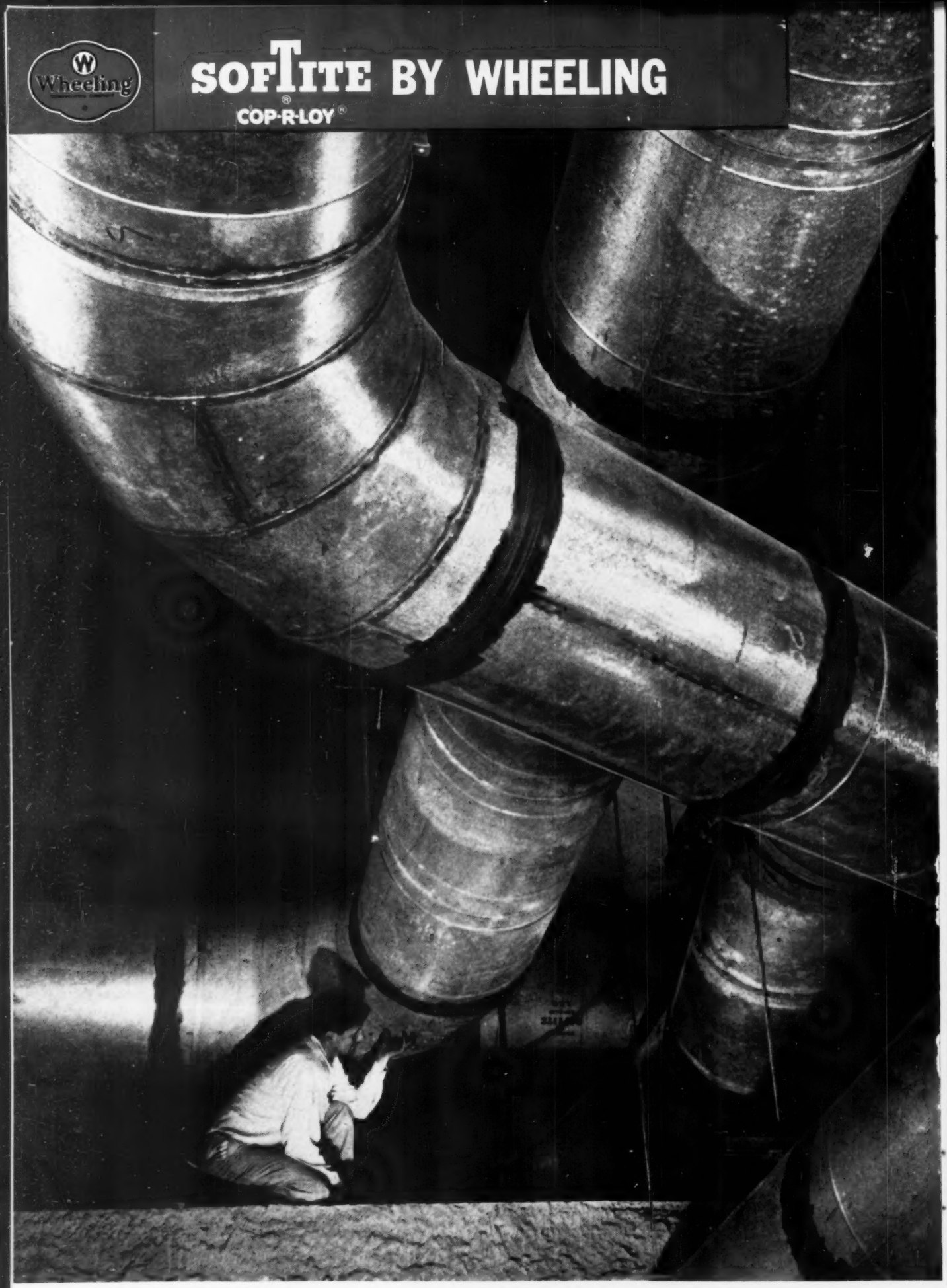
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Lee's Lecture

JOHN F. LEE
Broughton Professor and Head
Department of Mechanical Engineering
North Carolina State College

The Golden Decade

Professor John F. Lee has been appointed president of the new State University of New York, on Long Island. He will take over his new duties on February 1 of next year, after resigning his present post at the head of the Department of Mechanical Engineering at North Carolina State College.

Professor Lee, a graduate of The Citadel, with a Master's degree in mechanical engineering from Harvard, is an internationally known educator, having lectured at MIT, Northwestern, Cambridge, and the University of Paris. He is noted particularly for his work in statistical thermodynamics.

The new State University of New York will be located on a $250 million campus near Stony Brook, Long Island. Professor Lee will head a Graduate College as well as undergraduate divisions of Science & Mathematics, Arts & Sciences, and Engineering.

THE OPENING of the Golden Decade finds the free world – free peoples, markets, and enterprise – gaining rapid momentum in an economic upswing that holds dramatic promise for the future. Replacing the uncertainty, destruction, and enormous inflationary pressures of World War II are strong and stable growth trends in Western Europe, Latin America, the United States, and other important areas. The recovery phase of postwar economic history, with its emphasis on rebuilding economies, is completed, and a firm base for long-term expansion has been established.

For the first time in two decades, world production capacity is equal to current demands. This will confront the businessman with intensified competition. At the same time, world demand and capacity are starting unprecedented expan-

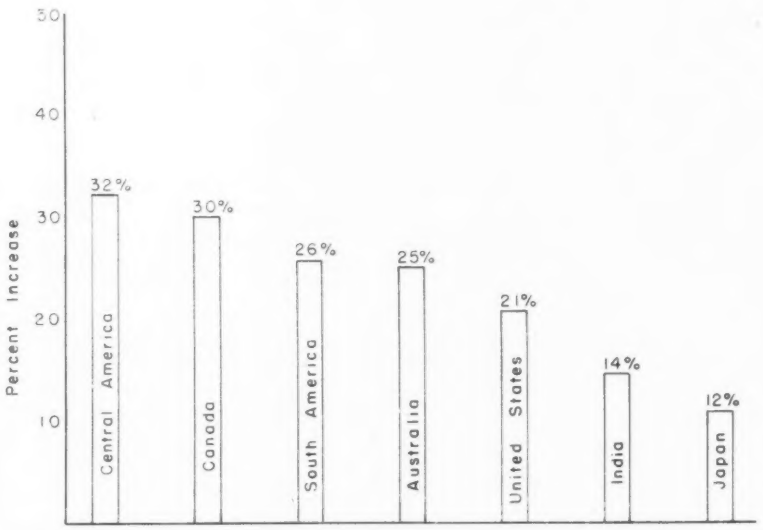

Fig. 1 – Percent increase in population for major areas, 1960-1970.

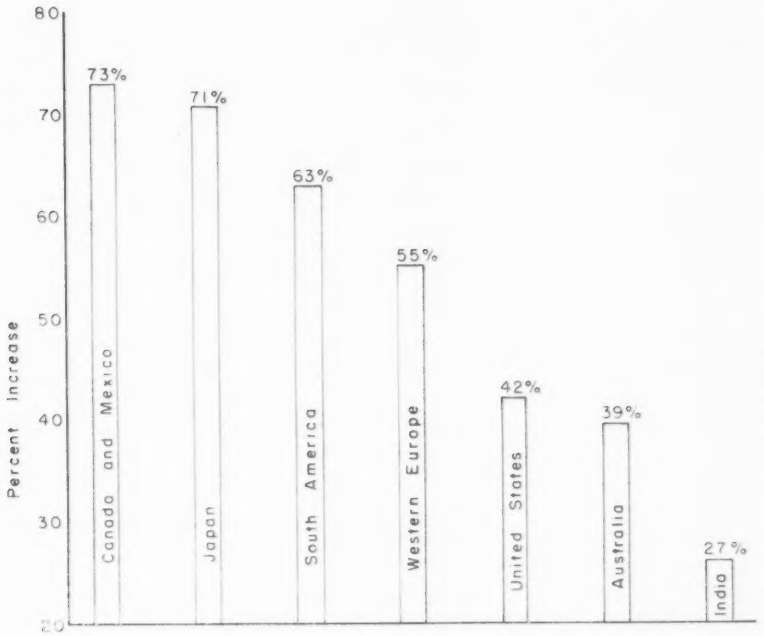

Fig. 2 – Percent increase in national output for major areas, 1960-1970.

sion. This will bring the consumer a wider range of choices. The challenge of the Fifties was a production challenge; the challenge of the Sixties is a marketing challenge.

In the next 10 years, the free world is likely to gain in population by an estimated 20 percent, and in national output by well over 50 percent. With demand for the essential commodities of life now reasonably satisfied in large sectors of the free world, markets for a long list of relatively nonessential goods and services are likely to develop at an accelerating rate.

Official population projections of international agencies such as the United Nations and the Organization for European Economic Cooperation point to generally rapid growth during the next decade in most areas of the free world. The relatively fast growth rates at the left of Fig. 1 reflect burgeoning population in undeveloped areas, or (as in Canada) substantial net immigration. The slow growth rates at the right of Fig. 1 mainly reflect the continuing impact of World War II population losses in areas most affected by the war.

The annual level of national output in the free world is expected to advance more than twice as rapidly as population; the increase for the free world as a whole is likely to exceed 50 percent during the next decade. Increases considerably more rapid than average are expected in Japan, in several countries of Western Europe and South America, and in Canada and Mexico. A comparison of the national output in major areas is shown in Fig. 2, above.

The United States

During the next decade, the U. S. economy is expected to grow vigorously – at least as rapidly as in the years since World War II, and perhaps faster. As the decade begins, national output in the United States has reached $500 billion. The compounding effects of a substantial growth rate on such a high initial base are expected to result in sharp increases in national output, consumer income, and personal spending. In fact, the next decade in U. S. economic history is likely to witness an important change in the traditional concept

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of the standard of living, as vast additions to spending power pour into the markets for goods formerly considered nonessential luxuries.

According to projections by the U. S. Census Bureau, the nation's population by 1970 may approach 220 million persons, or 45 million more than in 1958. The "high" projection would bring U. S. population to more than 20 percent above the currently estimated population for 1960. In the past, the "high" projection of the Census Bureau has actually tended to understate U. S. population growth, but even if the more moderate projections provided by the Census Bureau are representative, there will be almost 35 million more persons in the U. S. in 1970 than in 1961.

By 1970, the average work week in the U. S. may be as much as three hours shorter than the current work week, a decrease of about 6 percent. More leisure will mean increases in spending for a broad range of recreational, educational, and service activities. The expected rise in the U. S. labor force will more than offset the decline in hours worked per person, and total man-hours worked will rise about 6 percent.

One of the major accelerating forces in the economy will be a sharply higher level of business spending for bigger and better productive facilities. In the coming 10 years, U. S. industry will reinvest more than $560 billion in new plants, machinery, and equipment — almost 30 percent more than the investment rate of the Fifties.

By 1970, output of the U. S. economy will exceed $700 billion, according to conservative forecasts. More optimistic projections place the 1970 output rate in excess of $750 billion. Even conservatively, national production of goods and services in 1970 should be 60 percent higher than in 1958, and more than 40 percent higher than the levels likely to prevail in 1960.

By 1970, per capita income in the United States will approach $2300, contrasted with less than $1900 presently. The average family income for nonfarm families will exceed $9500 (it is now about $7500). This increase of more than 25 percent in family income implies a further sharp reduction in the number of families living at or near a subsistence level, and is likely to bring the bulk of the U. S. population within reach of a broad range of nonessential, semi-luxury consumer goods.

Personal outlays for goods and services in 1970 are likely to double the volume of such expenditures in 1950. The 1970 consumer market in the United States will be nearly $140 billion larger than the 1960 market. The increase is tantamount to adding an industry the size of the automobile business to the U. S. economy each year for 10 succeeding years.

The consumer goods markets of the Golden Decade will present enormous incentives to marketers. By 1970, annual spending for automobiles will approach $30 billion, or nearly double such outlays in the boom year of 1955. Spending on household goods and appliances will also be almost twice their 1955 volume. The increase in spending for food, while smaller on a percentage basis, will be dramatic in terms of dollars — perhaps $40 billion over the current rate.

Canada

The national output of Canada is likely to increase by more than 60 percent over the next decade. This assumes a continuing rate of net immigration and further exploitation of Canada's great natural resources. By 1970, the Canadian labor force is likely to exceed 8 million, roughly double the labor force of 1930, and 30 percent more than 1958. Canada's cumulative outlays on productive facilities in the coming decade may be as much as 80 percent greater than in the decade of the Fifties. All of the major ingredients required for rapid expansion — manpower, natural

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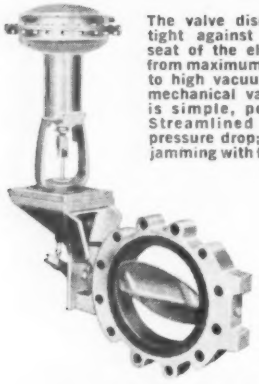
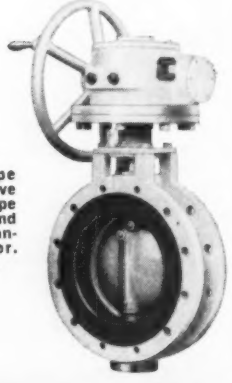


The valve disc seats drop-tight against the resilient seat of the elastomer liner from maximum line pressure to high vacuum. Manual or mechanical valve operation is simple, positive, fast. Streamlined design; low pressure drop; no fouling or jamming with foreign matter.

Wafer type butterfly valve with spool type rubber liner, available in "Keelok" snap-in, easily replaceable type or vulcanized to body. Shown with pneumatic operator. Bulletin 583.



Flanged type butterfly valve with spool type rubber liner and worm gear manual operator. Bulletin 582.

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resources, and a high investment rate — suggest a burgeoning Canadian economy in the years ahead.

By 1970, the Canadian population will exceed 21 million persons, based on relatively conservative estimates regarding net immigration. More optimistic forecasts indicate the population will exceed 22 million persons, or approximately 5 million more than the present total.

On the basis of an average estimate for net immigration, the national output of Canada is likely to reach $55 billion by 1970. This level may be considerably higher if the heavy prospective investment in Canada yields more rapid productivity gains than those of the past decade. In any event, Canadian national output by 1970 will be at least 60 percent above its 1960 level, and virtually double the level of 1955.

There will also be a sharp advance in personal spending. The total Canadian market for consumer goods and services in 1970 will exceed $34 billion, contrasted with a current spending rate of about $22 billion. The Canadian consumer goods market in 1970 will be nearly twice the size of the 1955 market.

Latin America

Latin America — including Central and South America, and the Caribbean market — is another of the areas of great growth potential during the 1960s. The region is rich in natural resources and its rapidly growing population already totals an estimated 200 million persons. Rising industrialization should establish Latin America in the free-world economy as a major producer and consumer. Realization of this potential will depend on the area's ability to achieve political and financial stability. In its search for stability and growth, it will doubtless have material assistance from the United States. By 1970, the output of Latin America will equal three times the Canadian economy of today.

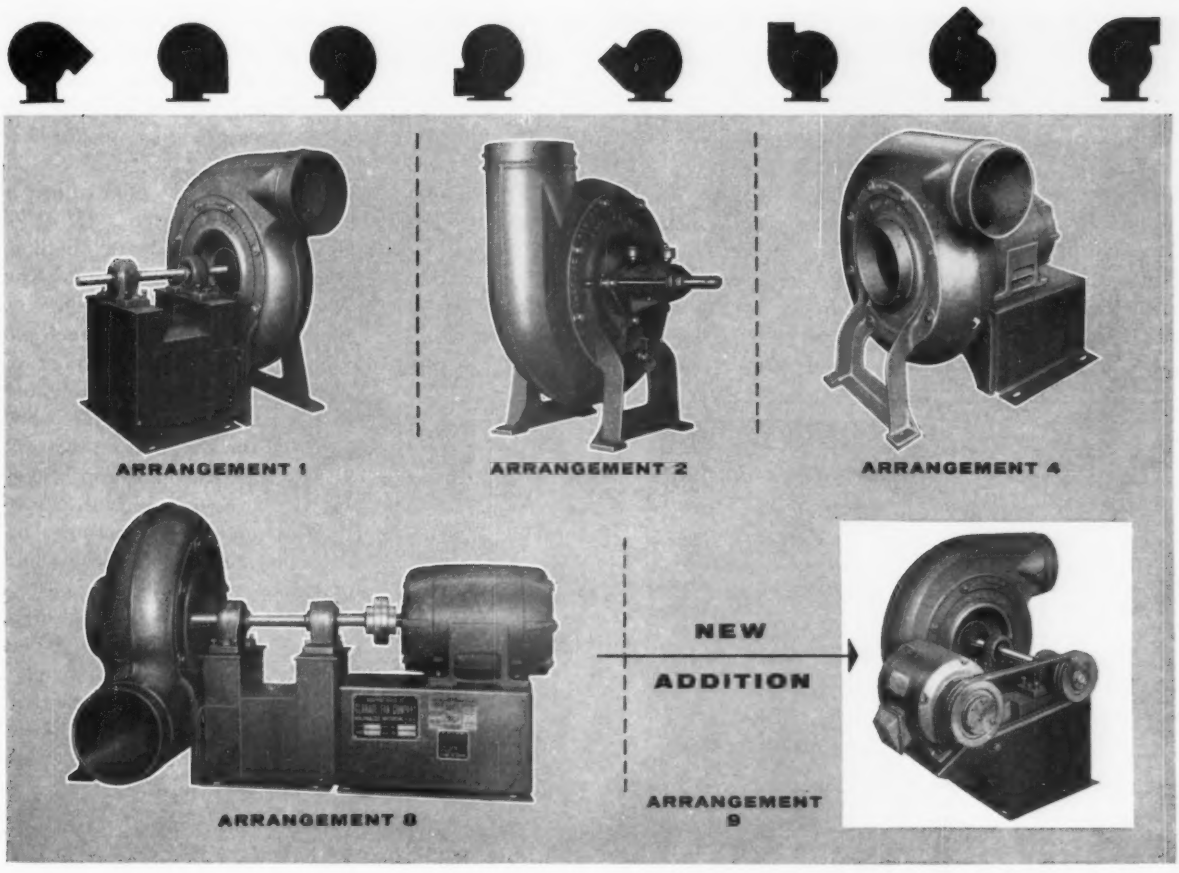
At the end of the decade, the population in the Latin American area as a whole (including the Caribbean area and dependencies) is likely to be almost 60 million above the present level — an increase of about 30 percent. National output in the region is now approximately $70 billion; by 1970, it will be considerably in excess of $100 billion. Living standards should improve rapidly in the next decade, and progressively open attractive new markets for consumer goods. The latent market for capital goods is already very large, and will be realized as industrialization gradually spreads.

In the "ABC" countries, which means the big three, Argentina, Brazil, and Chile, population has been increasing at a rate of between 20 and 30 percent a decade. In 1970, the combined population of the three countries should approach 120 million. A little over three-fifths of this increase of about 25 million will occur in Brazil. Currently, the combined total output of the "ABC" countries is approximately $17 billion. By 1970, it should be an estimated $24 billion. Recent growth in national output has been especially rapid in Brazil, but relatively slow in Chile, where it has been retarded by severe inflationary problems.

Mexico will show one of the steepest growth rates of any economy in the free world. Its population over the next 10 years will rise from over 33 million to 45 million — an increase of one-third. National output will more than double, expanding from over $10 billion to over $22 billion.

Western Europe

In the first postwar decade, the economies of Western European countries emerged dynamically from the destruction of World War II. In this period, growth rates were extremely rapid, but actual levels were relatively low. In fact, for long periods, they were below prewar levels of output. In the last



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five years, however, postwar recovery has led to a better distributed, more normal expansion.

Since the early Fifties, the nations of Western Europe have attained sound prosperity, and short-term growth projections indicate dramatic advances in these markets during the next decade. Productivity should continue to rise rapidly. After a brief lull in 1957-1958 (apparently a by-product of the U. S. recession) the annual growth rate of Europe has recovered to approximately 5 percent. This figure is slightly higher in the Common Market countries and slightly lower elsewhere.

Many countries of Western Europe will probably encounter labor-force problems in the next decade as a result of the distortions in population-age structure created by the low birth rates and loss of lives during World War II. However, the strong incentives to productivity in Western Europe, and the probability of continued net immigration into the area from behind the Iron Curtain, indicate that current area growth rates are likely to continue.

West European population is now about 295 million. By 1970, the population will be 320 million, based on available forecasts. The projected increase of 25 million, or about 9 percent, may be much too low, even though the number of persons reaching marriageable and child-bearing age will be far below normal in the next decade.

The rapid rise in Europe's output will be associated with a pronounced increase in consumer income and spending for goods and services. Currently, the West European market for goods and services is about two-thirds as large as that of the U. S. By 1970, it will be larger than the present U. S. market.

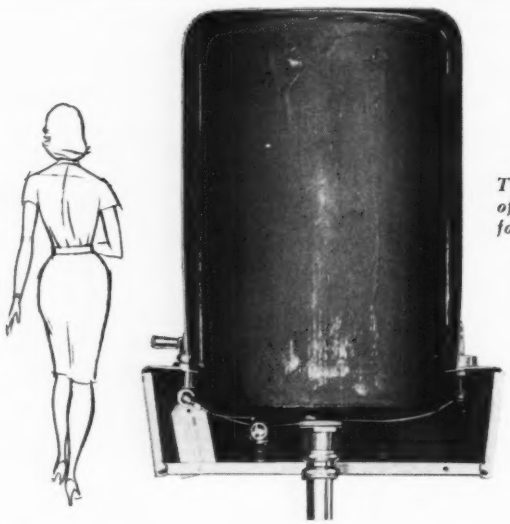
Western Europe's reinvestment in productive facilities, which amounts to about $30 billion annually, should rise to almost $50 billion by 1970. For four major countries, the indicated rate of increase in investment is particularly sharp. In the next decade, this may rise over 50 percent in France and the United Kingdom, and 70 percent in West Germany and Italy.

Western Europe's imports from the rest of the world are likely to advance from more than $20 billion currently to well over $35 billion by 1970. Imports for the Common Market countries will likely almost double, as rising prosperity creates new demand.

Total consumer spending in the Common Market countries, which is now less than $120 billion, will rise to over $200 billion by 1970. The market for durable goods will double, and total $23 billion by 1970. Spending for food will rise from $40 to $70 billion, and for clothing from $16 to $27 billion.

Other Areas

National economies and consumer markets are likely to grow equally

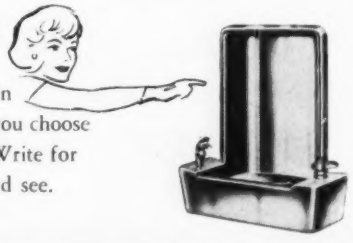


This is the back of Haws drinking fountain model 73

Look at the Back for a change!

Even our competitors' fountains look good from the front, but *Haws* models back up their good looks! This semi-recessed Model 73, for instance, is a beauty in 18 gauge, 304 stainless steel – and the craftsmanship goes *all the way around!* Careful quality is the standard at Haws – even on features you can't see. This fountain gives you automatic stream control; even has its head *locked* to the bowl for vandal-proof service.

And let's face it



This handsome Model 73 adds built-in class to hallways, lobbies – anywhere you choose to specify its beauty. You can't miss! Write for Haws comprehensive 1961 catalog and see. Write now!

Since 1909 HAWS **DRINKING FOUNTAINS**

a product of
HAWS DRINKING FAUCET COMPANY
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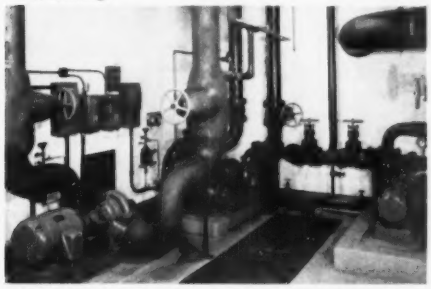
Old American Insurance Company's new home office building in Kansas City, Missouri. Distinctive styling in slab and glass incorporates functional beauty with clean, classic lines. Architects were Voskamp and Slezak; Mechanical Engineers, Scott and Kinney; General Contractor, S. Patti Construction Company; Mechanical Contractor, U. S. Engineering. All are Kansas City firms.

These two Weinman Pumps circulate hot water through the building's modern heating system. Each pump, operating alternately, delivers 260 gallons per minute against 40 ft. head; water moves continuously from hot water boiler to eight air conditioning units located throughout the building.



Three Weinman Pumps perform three separate pumping operations. One functions as a condenser pump against 58 ft. head; a second delivers chilled water through the air conditioning system at the rate of 900 gallons a minute against 65 ft. head; the third, operating against 45 ft. head, pumps 1000 gallons of water every minute to a decorative pool and waterfall at the building's main entrance.

Old American Insurance Company's sparkling new slab and glass quarters have perfect climate every day of the year. Eight Marlo heating and air conditioning units keep it cool in summer and warm in winter. And, the whole system depends on Weinman Pumps to furnish constant, unfailing water circulation.

The Marlo air conditioning system has a capacity of 290 tons and Weinman Pumps, functioning on a 'round-the-clock basis, provide a constant comfortable temperature by circulating 900 gallons of chilled water (45° to 53° F) through the entire system every minute. And, two Weinman Pumps, operating alternately, maintain constant heat control by moving 260 gallons of hot water from boiler to air conditioning units each minute.

One of the outstanding features of this modern office building is a picturesque pool and waterfall in front of the building entrance. Here, too, a Weinman pump plays an important supporting role, by delivering 1000 gallons of water per minute to keep the waterfall flowing constantly.

On the practical side, maintenance engineers use a Weinman for a condenser pump plus two Weinman Sewage Ejector Pumps to empty sewage from below grade level sewage basins. In an emergency, such as high water, back pressure on the sewer main closes the ejector system's motorized and back check valves. This diverts all sewage into the basin and Weinman Pumps handle all the building's sewage waste.

In expressing their complete satisfaction with the operation of the Weinman Pump installations, Old American Insurance Company officials commented especially on the ease of maintenance and the neat arrangement of Weinman Pumps.

Their experience with Weinman Pumps is typical and indicates one important thing — it pays to consult specialists when it comes to centrifugal pumps. So, if you have a tough pumping problem, save yourself time and money by calling your Weinman Pump Specialist. (He's in the Yellow Pages.) Or, if you prefer, write us direct.

MEMBER

WEINMAN PUMP

CENTRIFUGAL SPECIALISTS

fast outside the major continental areas. Of course, in the under-developed areas of Africa, Asia, and the Middle East, growth potentials are unlimited. But such growth will depend significantly upon yet unpredictable developments in foreign aid to be provided by more industrialized nations. Another key factor is the political instability caused by rising nationalism. In three major nations where the course of industrialization is already begun, and in some cases well advanced, existing growth rates suggest important additions to output and rapidly expanding consumer goods markets.

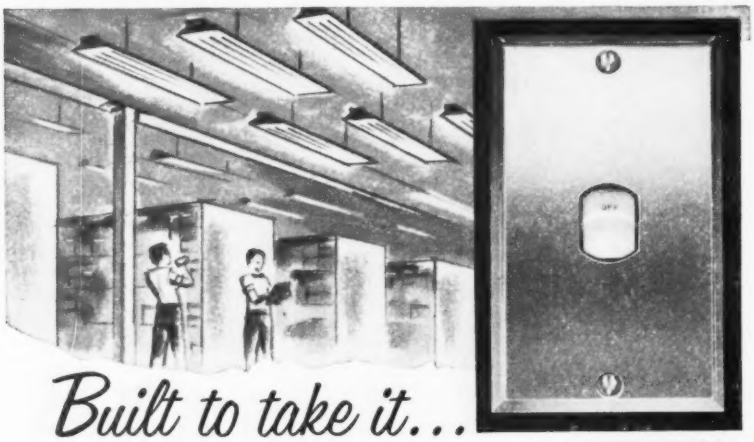
The Australian economy currently produces about $11 billion a year in goods and services. By 1970, its level of output should approach $16 billion, an increase of approximately 40 percent. This rate nearly equals that of the United States. The Australian population will increase about 25 percent by 1970 – a faster growth rate than that indicated for the United States.

National output in Japan is presently slightly higher than $30 billion annually. By 1970, the total should exceed $60 billion, assuming historical growth rates to 1962, and 5 percent a year thereafter. This would make the Japanese economy approximately as large as today's French or West German economy. Population in Japan has been increasing relatively slowly, and by 1970 should be roughly 12 percent greater than at present. The very sharp prospective rise in national output, compared to the rise in population, indicates a spectacular improvement in Japanese living standards, with resultant gains in the consumer market.

The opening of the decade of the Sixties finds living standards in India in a severely depressed condition. The per capita output in India is approximately 2 percent of the current United States level. However, the recent trend in population and output in the Indian economy indicates significant improvement in the next decade. Existing population projections suggest a rise of about 14 percent during the next 10 years, with output increasing at approximately twice that rate.

Promise for the Future

Having established the importance of international markets for American products in the Golden Decade, it is clear that success will hinge upon the ability of American engineers to advance technology at a more rapid rate than our competitors. Our products must have a competitive edge both in quality and price. Since price advantage must be obtained in competition with other nations with a lower standard of living, considerable ingenuity will be required. There is little doubt that American engineers can meet this challenge once they are cognizant of its demand on their talents. ▲▲



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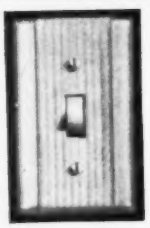
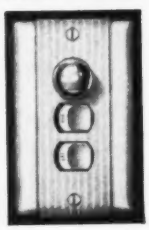
P&S ROCKER-GLO
SWITCH





Here is a switch that can take it . . . and come back for more. Install Rocker-Glo in the most used and abused stations in institutional, commercial or factory building. Then watch its continuous, perfect, satin-smooth performance.

P&S Rocker-Glo switches are AC switches, designed to be used at full current ratings on tungsten filament and fluorescent loads – one does the work of two AC-DC switches for controlling fluorescent fixtures. Rocker-Glo can be used anywhere old-style toggle switches are used.

Rocker-Glo is sturdily constructed. Its rugged, wall-hugging luminous rocker is not subject to breakage from accidental blows as is the case with ordinary switch handles. It's built to withstand punishment ordinary toggle or specialty switches cannot take – changes no wiring habits. Single Pole and Double Pole switches are indicating – you can tell when they're on or off.

Available in Despard interchangeable type, Despard Type mounted on strap and narrow rocker for tumbler switch plates. A specification grade switch, 15 and 20 amps. 120/277 volts AC.

For more information write Dept. CE-116

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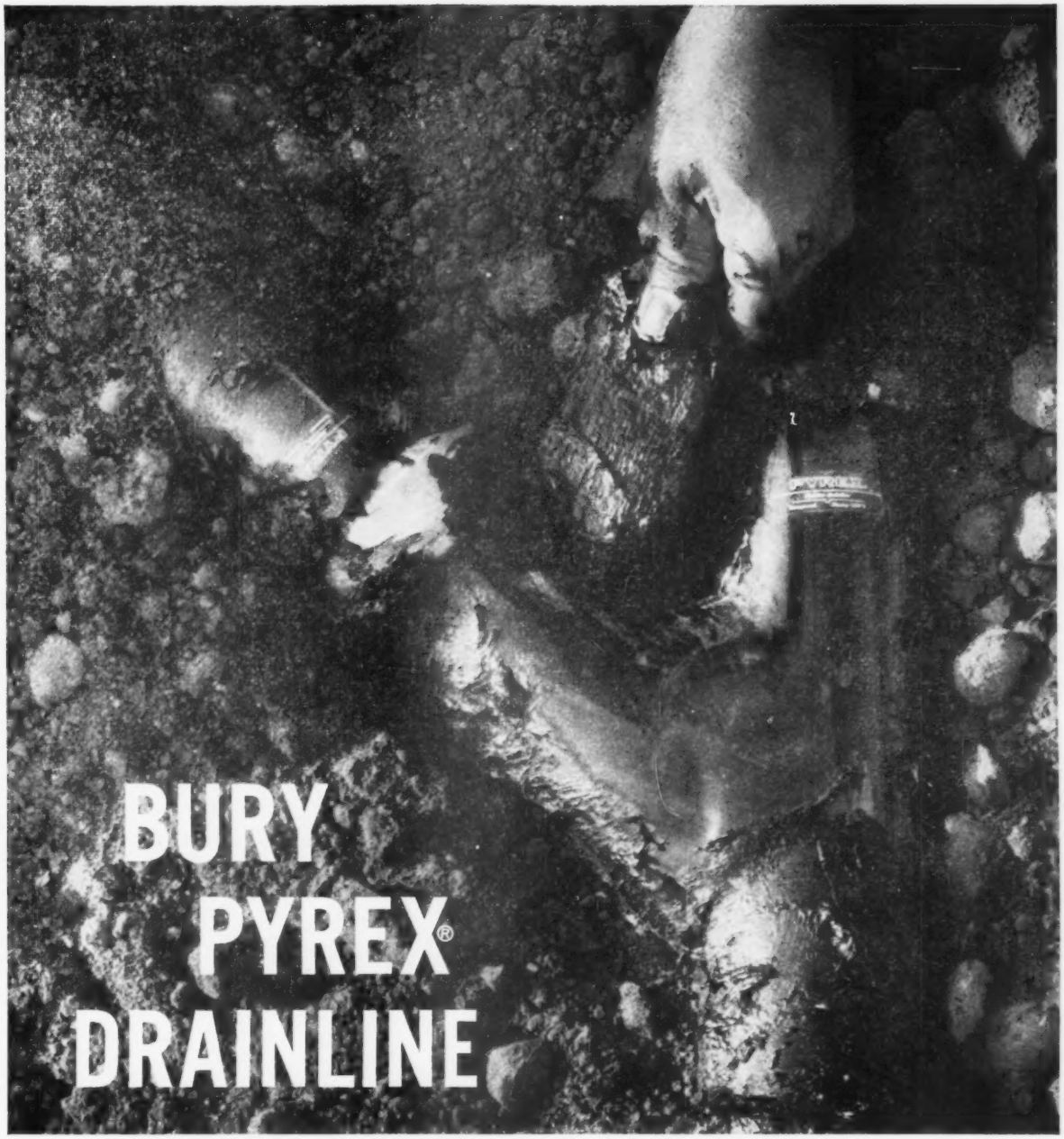

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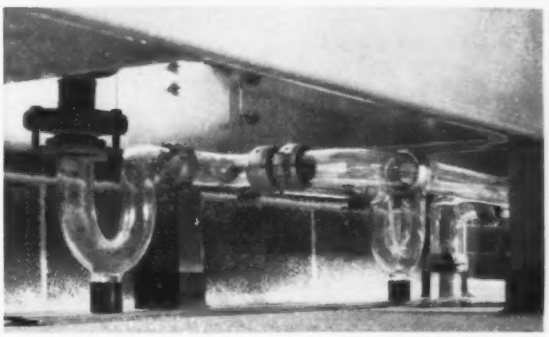
Ask any bench chemist and he'll tell you of the matchless corrosion resistance of the PYREX labware he uses daily.

Why not have the same corrosion resistance in laboratory drainlines or waste lines? A PYREX drainline will handle any acid material except massive quantities of hydrofluoric acid. Even buried in the ground, it resists rust, rot, and electrolytic corrosion.

NEW BULLETIN TELLS ALL. PE-30 explains all about the drainline and the new one-nut joint (patent pending) which makes it the least expensive drainline you can install. Write 2411 Crystal Street, Corning, N. Y.

CORNING GLASS WORKS
CORNING MEANS RESEARCH IN GLASS

200 feet of PYREX drainline are buried underneath concrete at Frontier Chemical's new research center in Wichita, Kan. All standard fittings are available.



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The newest concept in reducing fire destruction to commercial and industrial property is the application of Fire and Smoke Protection Ventilating Devices. Penn has prepared this complete technical report to present clearly the many important elements that must accompany the installation of Fire Vents.

The Penn Report provides for the first time, Fire Hazard Rating Charts that simplify selecting the appropriate number of vents required for a given area and hazard condition. Factors such as proper sizing and spacing of units in relation to plant construction are also reported upon. In addition, this Report presents valuable engineering data on the most advanced Fire Vent designs available from Penn.

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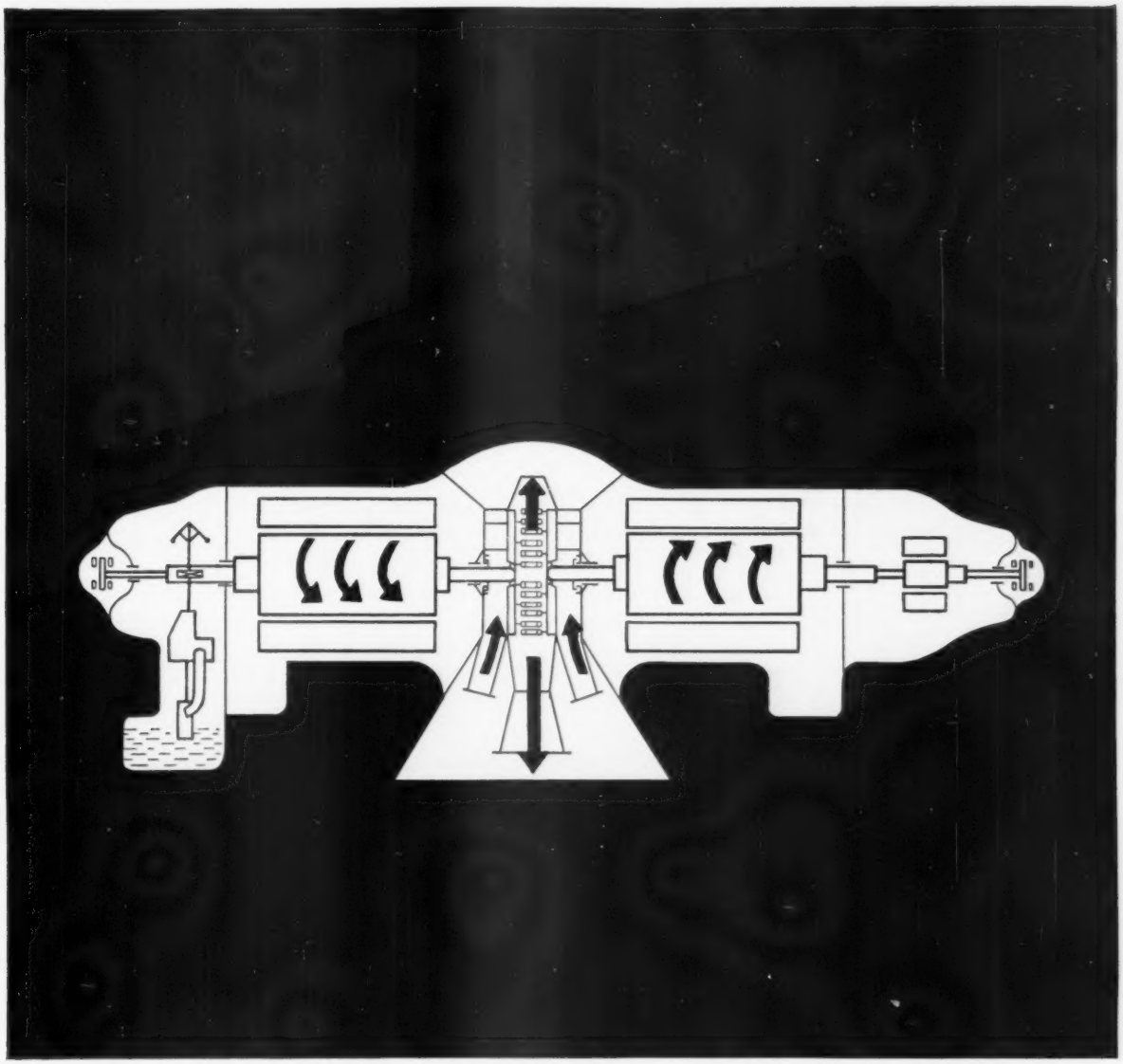

The First Radial Double Rotation STAL Steam Turbine In The United States

The last word in thermodynamic efficiency, lowest space requirements, inexpensive foundations, and low crane costs is Sweden's Radial Double Rotation STAL Steam Turbine. Designed to meet the most demanding requirements, STAL Steam Turbines are installed in power stations the world over with unparalled success. The ease of handling and simplicity of operation will make the Radial Double Rotation Turbine a favorite with power stations, paper mills, chemical plants and hundreds of other users in industry here. For free illustrated booklet write to: ASEA ELECTRIC, INC. 500 Fifth Avenue, New York 36, N. Y./55 New Montgomery St., San Francisco 5, California.

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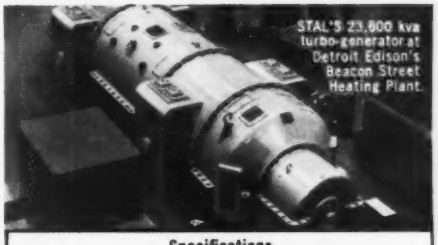

STAL'S 23,600 kva turbo-generator at Detroit Edison's Beacon Street Heating Plant.

Specifications

Make ..... STAL	Turbine Heat Rate....3506 Btu/kwhr
Type..... Radio flow double rotation	2-3600 rpm Generators —Air Cooled
Throttle Steam Conditions...870 psig, 700F	Power Factor 0.88
Maximum Throttle Flow... 500,000 lbs/hr.	Back Pressure.150 psig
Heaviest Life During Erection..... 21.5 tons	Rating .....23,600 kva (combined)

For carrying corrosive drainage..... THIS YOU MORE SERVICE... THAN ANY

Artist's drawing shows ASBESTOS-BONDED in cross section.

Steel

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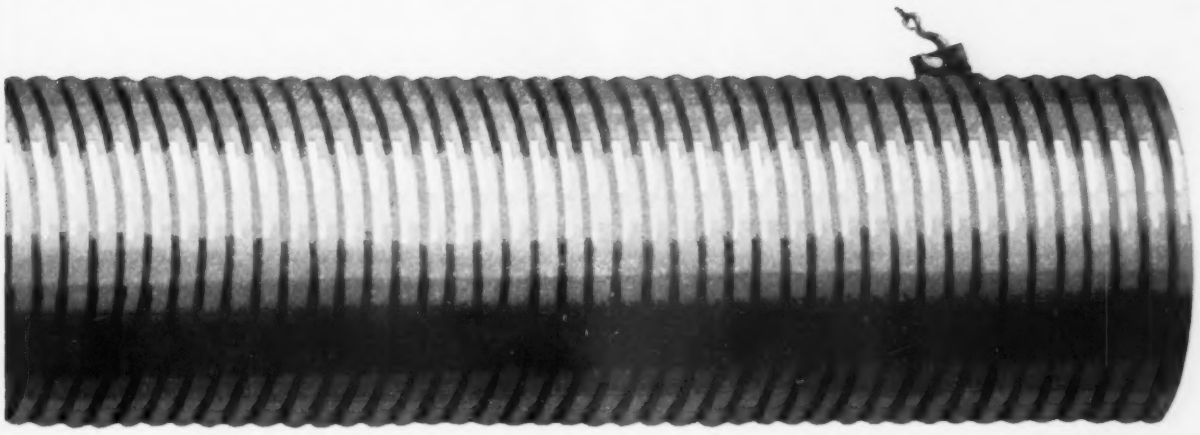
OTHER PIPE YOU CAN BUY



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On Erie Thruway twin bridges—

USS MAN-TEN High Strength Steel

USS MAN-TEN Brand High Strength Steel was used for the highly stressed members of these two bridges, including many of the upper and lower chords, diagonals, verticals and gusset plates. Bridge owner: Pennsylvania Department of Highways. Designer: Richardson, Gordon & Associates, Pittsburgh. General Contractor: Brayman Construction Co., Pittsburgh. Erector and Fabricator: The Levinson Steel Co., Pittsburgh.

saves weight and cuts costs

The use of high strength steel as a means of saving weight and reducing costs in bridges is rapidly gaining favor. These twin bridges across Six Mile Creek on the Erie Thruway, 15 miles east of Erie, Pennsylvania, were built with 600 tons of USS MAN-TEN Brand High Strength Steel to ASTM specification A-440 and 1,200 tons of ASTM A-7 Steel.

High strength steel was used for heavily stressed members where its higher allowable stress value and weight savings made it more economical. The design stress in bridges for USS MAN-TEN Steel is usually 24,000 psi compared to 18,000 psi for ASTM A-7 Steel. The members shown in color in the diagram were made of USS MAN-TEN High Strength Steel. In addition, many of the gusset plates were MAN-TEN Steel.

Weight savings: USS MAN-TEN (A-440) Steel fully meets all the requirements of the new ASTM specification A-440. When full advantage of its higher yield point—50% greater than structural carbon steel—is utilized, it allows the engineer to design with smaller sections than would be normally used—and thereby realize weight savings up to 25%. A cost savings is also possible, since anywhere USS MAN-TEN Steel accomplishes a weight reduction over 16%, it then becomes the more economical steel to use.

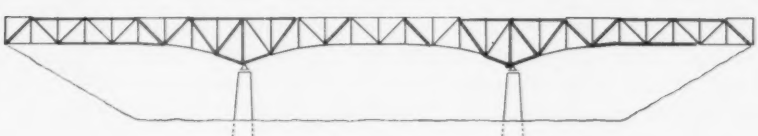
Other USS High Strength Steels available for construction include USS TRI-TEN and USS COR-TEN Steels. Like USS MAN-TEN Steel, these grades have a minimum yield point of 50,000 psi and offer the same weight and a potential cost savings. USS TRI-TEN Steel particularly is recommended for welded structures, while USS COR-TEN Steel, because of its outstanding resistance to atmospheric corrosion and superior paint adherence qualities, is a "natural" for bolted or riveted structures where maintenance is a problem.

Where an extra high yield strength steel is needed, USS "T-1" Constructional Alloy Steel combines weldability and toughness with 100,000 psi minimum yield strength.

For complete information on any of these steels, write United States Steel, 525 William Penn Place, Pittsburgh 30, Pennsylvania.

USS Steels for Bridge Design

Structural Carbon Steel 33,000 psi minimum yield point	**USS MAN-TEN High Strength Steel** 50,000 psi minimum yield point
USS TRI-TEN High Strength Steel 50,000 psi minimum yield point	**USS "T-1" Constructional Alloy Steel** 100,000 psi minimum yield strength



Where high strength steel saved money. Profile of one of the two bridges showing members made of USS MAN-TEN Steel where its high strength/weight ratio made it economical to use.

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This mark tells you a product is made of modern Steel

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Big Plans for the Big Show

New York Gets Ready For Another Fair

MARJORIE ODEN, Eastern Editor

Fair Notes

NEW YORK CITY'S 1964-65 Worlds Fair, located in Queens near LaGuardia Field, may become a $600 million project — designed solely by consulting engineers and architects. This design policy was established by Robert Moses, the Fair's president, and has the enthusiastic support of the chief engineer, Brig. Gen. William Whipple Jr.

As Whipple explained, "Our intention is to give 100 percent of the engineering design work to consulting engineers. For the last fair, the chief engineer had a staff which included more than 600 persons at its peak. For the new fair, which will be even larger, we have decided that instead of building up a large organization, we will utilize consultants and architect-engineers to the utmost. I have, at this time, a staff of less than a dozen and I do not expect to exceed 20 at any time during the construction period. This approach is more difficult to administer and the problems of coordination are considerable. However, it saves enormously on overhead. With the technical ability and enthusiastic interest being manifested by all concerned, I feel certain we will be able to meet all requirements, and that this fair will be designed and built on schedule and in accordance with the highest technical standards."

Consulting engineers used thus far have been from the New York City area. However, once the preliminary stages are over, consulting engineers throughout the county should stand an equal chance of getting assignments.

Space Allocation

The principal areas of the fair will be Transportation (for exhibitors of transportation equipment), Amusement, Federal and State, International, and Industrial. Land will be leased to the individual states, countries, or industries and each will be responsible for his own building — subject to Fair Corporation approval.

From time to time, when definite commitments as to space have been made and leases signed, the Fair management will announce them. It should be noted, however, that the management does not volunteer recommendations and has no preferred list of architects, engineers, builders, or other firms available and interested in design or construction within the Fair grounds. Officials further request that interested engineers and builders communicate directly with the various exhibitors — not the Fair management.

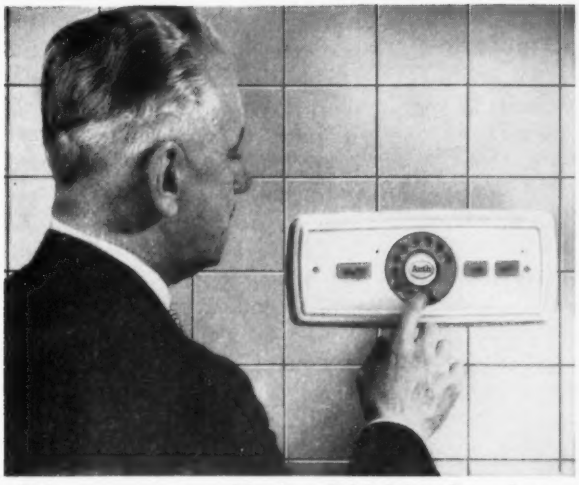
For consultants in the New York area, the fair provides an additional windfall, for there will be $94 million in highway construction on parkways and expressways leading to the fair site in Flushing Meadow Park. All of this work was originally scheduled as a part of the highway program, but it has been moved ahead to help handle the millions of fair visitors expected. The Federal government will pay 80 percent and New York State 10 percent of the land acquisition cost, with an additional $700,000 provided by New York City.

Boards Established

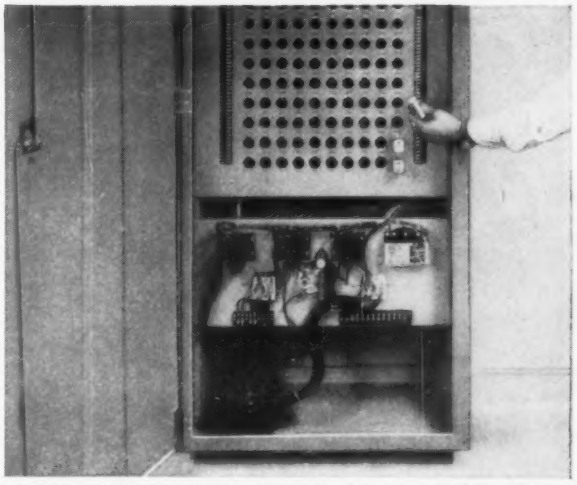
One of the first actions of the Worlds Fair Corporation was the appointment of a Design Board headed by architect Wallace K. Harrison. Architects Gordon Bunshaft and Edward D. Stone, industrial designer Henry Dreyfuss, and consulting engineer Emil Praeger are members of the Board.

In addition, W. Earle Andrews, of Andrews & Clark, consulting engineers, was retained, under an $80,000 city appropriation, to determine the condition of the utilities and pile foundations left on the 1200 acre site from the 1939 Worlds Fair, and generally to appraise the site for new construction.

As opposed to the Board of Design's more general function of establishing the over-all outline of the fair to harmonize with the theme "Man's Achievements in an Expanding Universe," the fair also has named four men to work closely with General Whipple on all

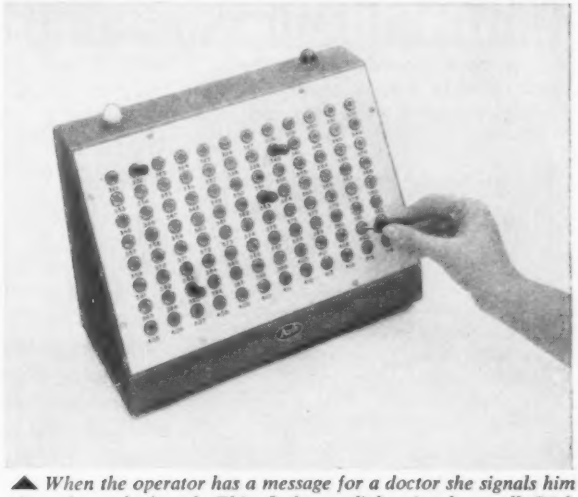


▲ *Doctors—entering and leaving—dial 3-digit code numbers on small Dial-Registers placed at convenient locations—then press the IN or OUT button.*



▲ *Their IN-OUT status is transmitted by electrical impulses to the control center. There the information is stored for release to any IN-Former which interrogates it.*

▲ *IN-Formers are used by the telephone operator and others to check any doctors' IN-OUT status by dialing his code number. Colored lights reveal his status.*



▲ *When the operator has a message for a doctor she signals him through a plugboard. This flashes a light signal on all Dial-Registers as he dials himself IN or OUT.*

"DIAL-IN"

—the Best Doctors' In-and-Out Register System for Large Hospitals

This unique new staff register system is really a boon to large hospitals. When a doctor is urgently needed much time can be saved—perhaps a life— by knowing immediately and reliably whether or not the doctor is in the hospital. In large-staff hospitals with a number of entrances—or a number of buildings—the problem of registering the coming and going of doctors has defied a satisfactory solution. Up to now conventional register systems have required too much space; too much installation expense; too much inconvenience and time-loss to doctors and hospital personnel. Now, the Auth "Dial-IN" system eliminates these obstacles and makes it possible for large-staff hospitals to know who is in within a few seconds—and it does this conveniently for everyone and at reasonable cost.

The "Dial-IN" System and other types of doctors' in-and-out register systems; nurses' call systems; and doctors' paging systems—all designed to increase the efficiency of your hospital —are manufactured by AUTH. A representative is ready to discuss them with you. No obligation, of course.

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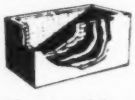


. . . natural or synthetic rubber and asphaltic materials designed to meet specific corrosive conditions within your plant and installed at the job site or in Atlas shops.

ATLAS RIGID PLASTIC STRUCTURES

. . . corrosion-proof, self supporting polyvinyl chloride designed and fabricated for use as tanks, ducts and fume systems to meet your exact needs . . . plastic pipe systems to convey all your corrosives.

These products will give you permanent plant-wide protection against corrosives.

Write for Bulletin CC-3.

ATLAS MINERAL PRODUCTS COMPANY
MERTZTOWN, PENNSYLVANIA

engineering details. The consultants include Andrews; Gilmore D. Clarke, of Clarke & Rapuano, consulting engineers; General Thomas F. Farrell; and Walter Dorwin Teague, industrial designer.

Exhibitors Foot The Bill

According to General Whipple, "Many large industrial corporations already have applied for space, and each one of them will finance, design, and construct its own building and landscape its own grounds on space rented from the Fair Corporation. Various states (New Jersey was the first to apply) and, of course, the Federal government, will also construct their own facilities under similar arrangements. In addition, 82 foreign governments are being invited to exhibit.

"Unlike the previous New York Worlds Fair, the Fair Corporation does not expect to finance and build facilities to house participants. We are studying the possibility of grouping smaller concerns, and possibly groups of smaller countries, in either single large structures or harmoniously planned aggregates of smaller contiguous structures. However, in all cases, financing and construction will be handled by the exhibitors rather than the Fair Corporation."

During all this, General Whipple and his consultants will keep a close eye on all designs to be sure they comply with the fair's building code. "Also, Whipple stated, "We must control lighting, use of extravagant colors, limitations on noise, flashing signs, quality of advertising, and even incongruities in architectural style."

Port Authority Involved

The Transportation Section will be handled in a similar manner, but by the New York Port Authority. This 80-acre exhibit section will be developed and operated on a self-supporting basis, with the Port Authority administering the general fair policies. However, according to one Port Authority announcement, "If it should be advisable to provide a building for the common use of a number of exhibitors, the Port Authority would do so if it could be done on a self-supporting basis." Thus, at least one portion of the Fair may be designed by a public engineering organization.

The Amusement Section is visualized by the Design Board as resembling Tivoli more than Coney Island. There is a distinct possibility, that it will be left intact for permanent operation.

The Design Board further visualizes that "ponds and streams will add natural beauty to the Fair. There will be water panels and fountains fed by new wells with adequate pumping facilities and purification. Colorful foot bridges and tree-shaded areas of repose will be created and retained as permanent features of the park." (The Fair Corporation has agreed to restore the area as a park and return it to New York City.)

The fair hopes to provide parking space for 20,000 cars. This involves more land than is currently available, so New York City is being asked for the use of swampland now being filled by the Department of Sanitation. The filling operation could be completed and the area paved, well before opening day. Bus service will be provided to the Fair gates.

Fair Has Own Building Code

One of the earlier, and more unusual assignments to date has been the writing of the fair's building code. Purdy & Henderson Associates, Inc. was given the project, with a four month deadline for completion. With the assistance of Syska & Hennessy on the mechanical and electrical portions of the code, the deadline was met and the code was scheduled for consideration before the City Council's buildings committee in early October.

As Frank Burgess, of Purdy & Henderson, explained, "Most build-

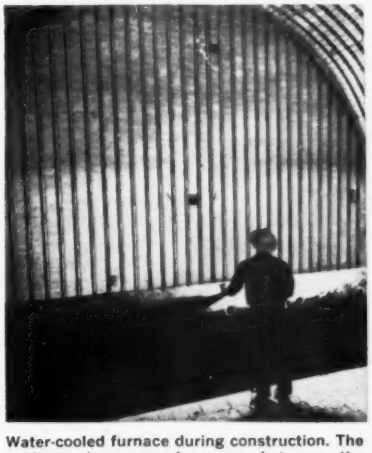
The new incinerator at Whitemarsh. Note the neat compact lines of the building and the low stacks of the wet scrubbers which emit a plume of steam. Glace & Glace, Inc. were consulting engineers for the project.

new method lowers refuse disposal costs—gives communities

smoke-free, odorless, economical incineration

Communities across the country have experimented with various methods of refuse disposal. Their experiences amount to a test-in-actual-use of practically every approach to the problem. Today, backed by cost, convenience and long range land use considerations, many have gone to incineration as the best solution. This is especially true since a new type of incinerator now brings costs into line with most community budgets.

This new type of incinerator was adopted by Dravo Corporation after intensive research into the refuse and sludge disposal problems of communities of all sizes. The Dravo Incinerator provides almost completely automatic operation and reduces the number of operators required. It takes full advantage of the latest materials handling techniques to eliminate litter. It utilizes modern combustion principles to eliminate smoke and odor. Each part of the system has been selected for rugged construction and ability to contribute to overall efficiency. Two of the most important parts are the storage conveyor and the furnace.



Water-cooled furnace during construction. The cooling pipes can be seen between the courses of refractory brick. Oil burners are used for ignition only; no additional fuel is needed to support combustion of refuse.

THE STORAGE CONVEYOR. Trucks are dumped indoors so that trash will not be scattered around the area. Refuse falls through an opening in the floor directly into the conveyor hoppers. The hoppers oscillate mechanically, throwing the material forward. This action is self-scouring and refuse does not stick to the sides or bottom of the hopper.

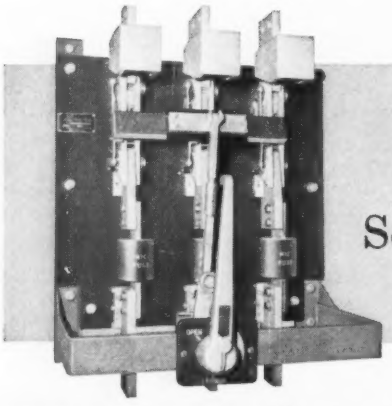
The refuse empties into feeders which charge it into the furnace. Automatically operated on a controlled time cycle, the feeders lock a layer of refuse against the furnace gates. This maintains an effective seal, permitting good control of furnace draft.

THE WATER-COOLED FURNACE. The furnace is constructed of first quality fire brick in which water filled cooling pipes are embedded on 8-inch centers. The cooling pipes maintain furnace wall temperatures below the slagging point of the refuse ash. This construction permits intermittent operation without the need for a long cooling period. In addition, the walls are thinner, and refractory maintenance is reduced to a minimum. The higher combustion temperatures made possible by water cooling improves burning rate and eliminates noxious odors.

Partially loaded hopper. Walls and floor are kept clean by the oscillating action. The hoppers are mounted on air springs, which compensate automatically for the load in the conveyor.

The Dravo Incinerator is the economical solution to the problem of refuse disposal. Dravo offers to furnish and erect the mechanical equipment and accepts overall process responsibility. For more information, write or call DRAVO CORPORATION, PITTSBURGH 22, PENNSYLVANIA.

DRAVO
CORPORATION

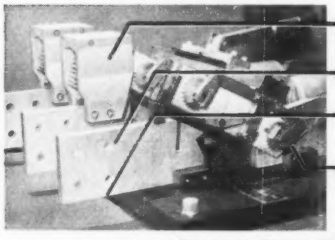


A New Load Break Service Entrance Switch

BOLT-LOC* by BARKELEW

FOR 1200 • 1600 • 2000 AMPERES • 240 • 480 • 600 VOLTS

Designed primarily for use with high interrupting capacity fuses for service entrance applications, and with or without fuses, as isolating switches, feeder disconnect or protector switches, for controlling electrochemical processes or any other use where cool operation, rugged construction, safety and complete reliability are required. Thoroughly tested for interrupting, short circuit and load carrying capacity.

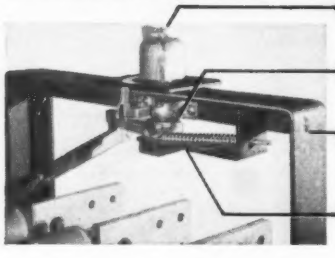


Molded arc suppressing material houses double slot multiple steel plate arc quenchers.

Vertical terminal contacts for easy bus and cable connections.

Using adapters, bus bars can be mounted parallel to base.

Positively locked forged nut for adjusting contact pressure, pre-set and locked at factory. Stainless steel spring holds initial contact pressure.



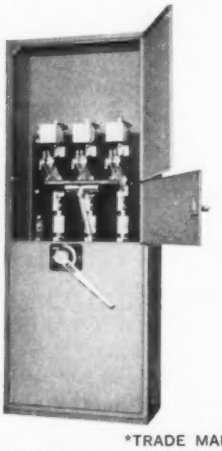
Handle contains latch for holding switch open or closed and slot for four padlocks.

Large bronze sleeve bearing supports operating shaft. Close tolerances throughout the switch mechanism give positive operation and long life.

Formed frame supports operating mechanism. No additional supports needed. Switch is adjusted before shipment, ready for mounting.

Quick break mechanism opens switch rapidly, drawing arc thru quenchers where it is quickly extinguished, usually in less than 1½ cycles.

Available standard enclosures 32" wide by 14" deep by 76½" high. The fuse door and the upper switch access door are interlocked with the switch handle to prevent opening the doors with the switch closed or closing the switch with the doors open. The handle is arranged for using four padlocks in open and closed positions.



FOR COMPLETE DETAILS WRITE FOR

BULLETIN NO. 101

BARKELEW

*TRADE MARK

THE BARKELEW ELECTRIC MANUFACTURING CO.

MIDDLETOWN, OHIO

ELECTRICAL SWITCHING EQUIPMENT SINCE 1904

ing codes are historical documents, based on engineering successes of the past. Since we expect originality in the fair's architectural and engineering design, this code had to provide for the unknown. As a result, the code is a description of performance requirements without the usual detailed specifications of materials."

The fair site will include a few built-in problems. Since it is on former swamp and fill land, unstable soil runs as deep as 100 feet and most of the buildings are expected to be on pilings or spread footings.

Also, a portion of the fair is in line with one of LaGuardia Airport's runways, and the Civil Aeronautics Board may have a few words to say about building heights (although the Board of Design has suggested limiting all buildings to 80 feet.)

Work Already In Progress

Despite the fact that exhibitors are responsible for their own buildings, the Fair Corporation still has a huge construction program. An incomplete chart on General Whipple's wall shows the following work under way:

¶ Bridges and roads — Andrews & Clark

¶ Electrical distribution system — Syska & Hennessy

¶ Landscaping (including moving the Botanical Gardens) — Clarke & Rapuano

¶ Underground utilities — Hazen & Sawyer

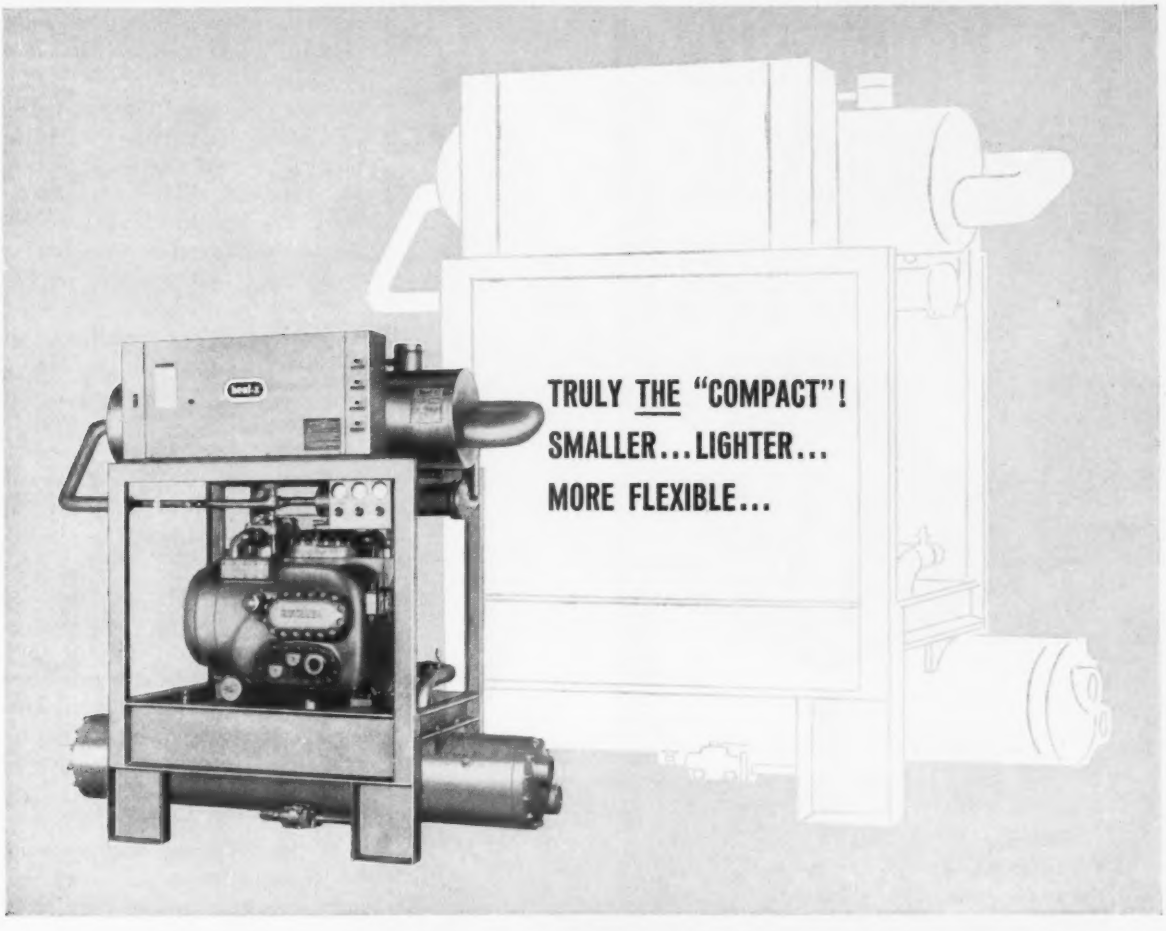
¶ Reclaiming and stabilizing lake banks — Moran, Proctor, Mueser & Rutledge

¶ Water purification — Hazen & Sawyer

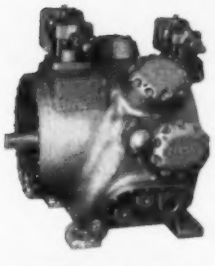
¶ Rehabilitation of amphitheater — Sears & Kopf

¶ New administration building — Skidmore, Owings & Merrill, with Syska & Hennessy

General Whipple also made veiled references to the possibilities of a "quite unique interior transportation system. And I am



NEW SPACE SAVING heat-x PACKAGE CHILLERS PACK MIGHTY COOLING CAPACITIES



POWERED BY THE FAMOUS BRUNNER MULTI-DRIVE COMPRESSORS, (HERMETIC OR DIRECT-DRIVE TYPE) RENOWNED FOR FIELD-PROVEN DEPENDABILITY

Greater cooling capacity with much less bulk—that's the story on this new line of Heat-X units for chilled water air conditioning and industrial water cooling applications.

Note the superior features of these ruggedly reliable, top performing chillers, available in capacities from 20 through 100 tons, completely self-contained, ready to install: Exclusive, space-saving Inner-Fin® chillers and heat interchangers • Chilled water passages of non-ferrous construction • Cleanable condenser-receivers • Capacity modulation and unloaded start • Indicator lights.

All necessary components . . . *often "extras" with others but always "standard" with Dunham-Bush* . . . include: gauges, thermostats, reversible oil pump, oil failure control, high-low pressure control, relief and purging valves, solenoids, expansion valves, filter-drier, liquid sight glass, control panel.

Though it's infrequently needed, when service is necessary it's simple. Just a glance at Heat-X Package Chillers shows the reach-in easiness for quick and economical servicing.

And don't forget, every part of every Heat-X Chiller is backed by a single source manufacturer's responsibility.

Get the facts. Request Heat-X Form No. 8023A.

Dunham-Bush, Inc.

WEST HARTFORD 10 • CONNECTICUT • U. S. A.

DUNHAM-BUSH

AIR CONDITIONING • REFRIGERATION • HEATING • HEAT TRANSFER

WEST HARTFORD, CONNECTICUT • MICHIGAN CITY, INDIANA
MARSHALLTOWN, IOWA • RIVERSIDE, CALIFORNIA
SUBSIDIARIES

which size stack do YOU prefer?

Each does the same job— the smaller one is equipped with a Lehigh Induced Draft Fan

Lehigh Induced Draft Fans are designed to help eliminate large, costly, unsightly stacks. They maintain a *constant* over-fire draft regardless of atmospheric conditions, help keep boilers operating at *maximum* efficiently at all times, and significantly *lower fuel bills* . . . while radically *reducing* the size of your stack.

Rugged Construction—long life: to prevent distortion under elevated temperature conditions, the fan housing, bearing pedestal, motor support and fan wheel of Lehigh Draft Induced Fans are constructed of all-welded integral 3/8" mild steel. A radiant heat cover and an aluminum heat flinger protect the inboard bearing from radiated heat. And because both bearing and shaft are kept to a low operating temperature, the Lehigh Induced Draft Fan makes use of standard, self-aligning ball bearing pillow blocks. *All* Lehigh Induced Draft Fans feature a flanged inlet, flanged outlet, and inspection cover as standard equipment.

If you would like to reduce stack height . . . and gain optimum boiler efficiency . . . contact your local Lehigh Representative today. He'll gladly give you all the details. Or write directly to us for our detailed technical bulletin:

2171
LF-1

LEHIGH FAN & BLOWER DIVISION
FULLER COMPANY, CATASAUQUA, PA.
Subsidiary of General American Transportation Corporation

TRADE LEHIGH MARK

not talking only about monorail systems. We are considering something never tried before."

The telephone and gas companies are doing their own planning and design. Preliminary plans for this, and all the consultants' work, are scheduled for completion in late November. Deadline for final plans and specifications is next May.

"By the spring of 1962, I want to see the area ready for exhibitors to start construction so they can have two full construction seasons before the fair opens. The area must be drained, graded, served by roads, and provided with the basic utilities which will be needed for construction." General Whipple also said locations must be selected for the transformer station, hospital, building for lost children, and similar structures, before the land can be divided into acreages for subsequent leasing to exhibitors.

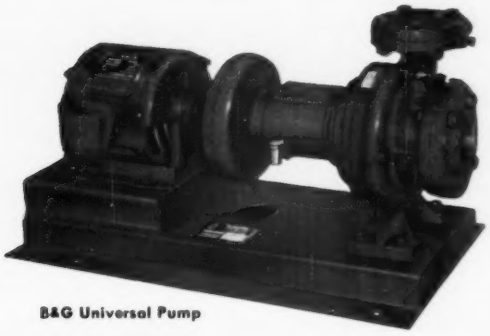
Single Contract Construction

A single, lump sum contract is to be let for a major portion of the fair's construction program after the design is coordinated. "This will allow utility lines to be placed in common trenches, and will avoid digging up road paving once it is laid. Also, we will avoid difficulties created by contractors interfering with one another in the same area. This single contract, which will probably run between $15 and $20 million, should attract some of the best contractors in the country, and we expect it will save us millions of dollars and many months of time."

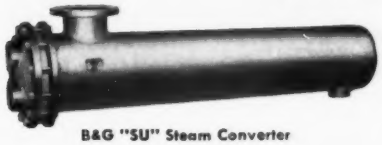
The Worlds Fair is moving efficiently, as Moses' projects tend to do. So now is the time for consultants to find out if their industrial clients or their states are planning to have exhibits at the fair. By the time the New York City's Worlds Fair list is published, the individual industries, states, and countries probably will have selected their engineers. ▲▲

Owens-Illinois Paper Products Division Plant, Chicago

Architects-Engineers: Skidmore, Owings and Merrill, Chicago, Illinois
Associates: Owens-Illinois Engineering Department
General Contractor: G. C. Luria Engineering Company
Heating Contractor: National Heat and Power Company, Chicago, Illinois



B&G Universal Pump



B&G "SU" Steam Converter

B&G Booster Pump

AUTOMATED CONTAINER PLANT HEATED BY B&G *Hydro-Flo*® FORCED HOT WATER SYSTEM

The high manufacturing efficiency of this 225,000 sq. ft. automated plant is matched by the efficiency of its heating system. Both office and factory workers are kept comfortable by a forced hot water system using B&G pumping and other *Hydro-Flo* equipment.

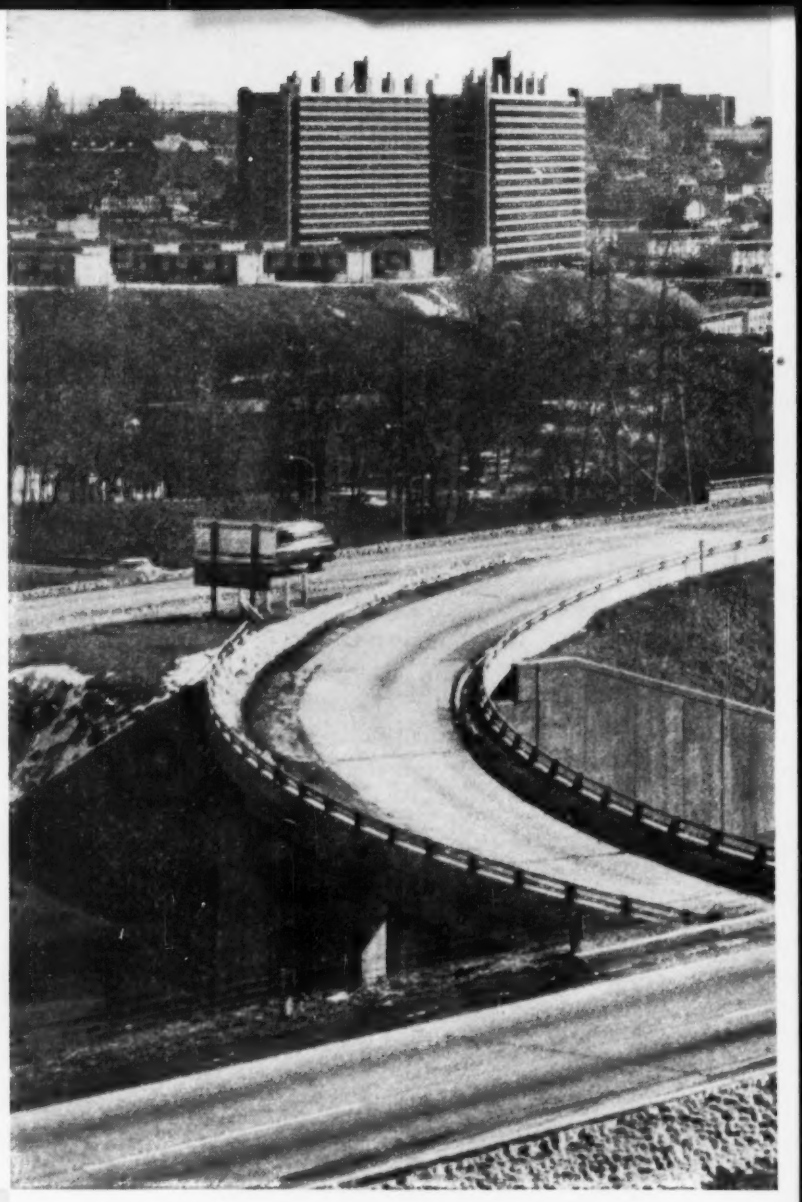
The selection of B&G Booster and Universal Pumps was dictated by the record of these units for quiet, vibrationless and dependable operation. They are not ordinary commercial centrifugal pumps, but are specifically designed and built to meet the exacting requirements of circulated water systems. Over 3,000,000 are operating today in heating and cooling systems.

Other B&G products installed in this outstanding building include "SU" steam-to-water converters, an Airtrol System for the positive elimination of air from the system and expansion tanks.

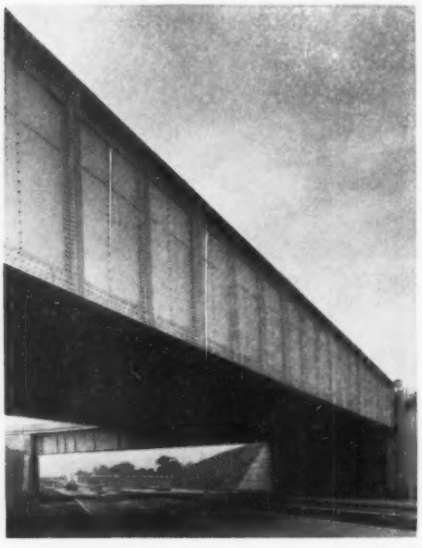
BELL & GOSSETT
COMPANY
Dept. GK-70, Morton Grove, Illinois

Canadian Licensee: S.A. Armstrong, Ltd., 1400 O'Connor Drive, Toronto 16, Ontario

This mark tells you a product
is made of modern, dependable Steel.



Only steel could do this job. City Line Avenue Interchange on Schuylkill Expressway includes seven grade separations on three different levels—an outstanding engineering job costing $3,000,000 to construct. Michael Baker, Jr., Inc. was responsible in total, for the design of approximately 50 million dollars worth of the Schuylkill Expressway project.



Short-span bridge over Pennsylvania Turnpike at Norristown, Pa., designed in steel for fast erection and low cost.

Mr. Michael Baker, Jr. at far right, discusses the Schuylkill Expressway—City Line Avenue Interchange at Philadelphia that his company designed with USS Structural Carbon Steel. Other men include Joseph Mundo, Wayne H. Meyers, C. V. Knudsen, Robert L. John and C. F. Eben, Jr.

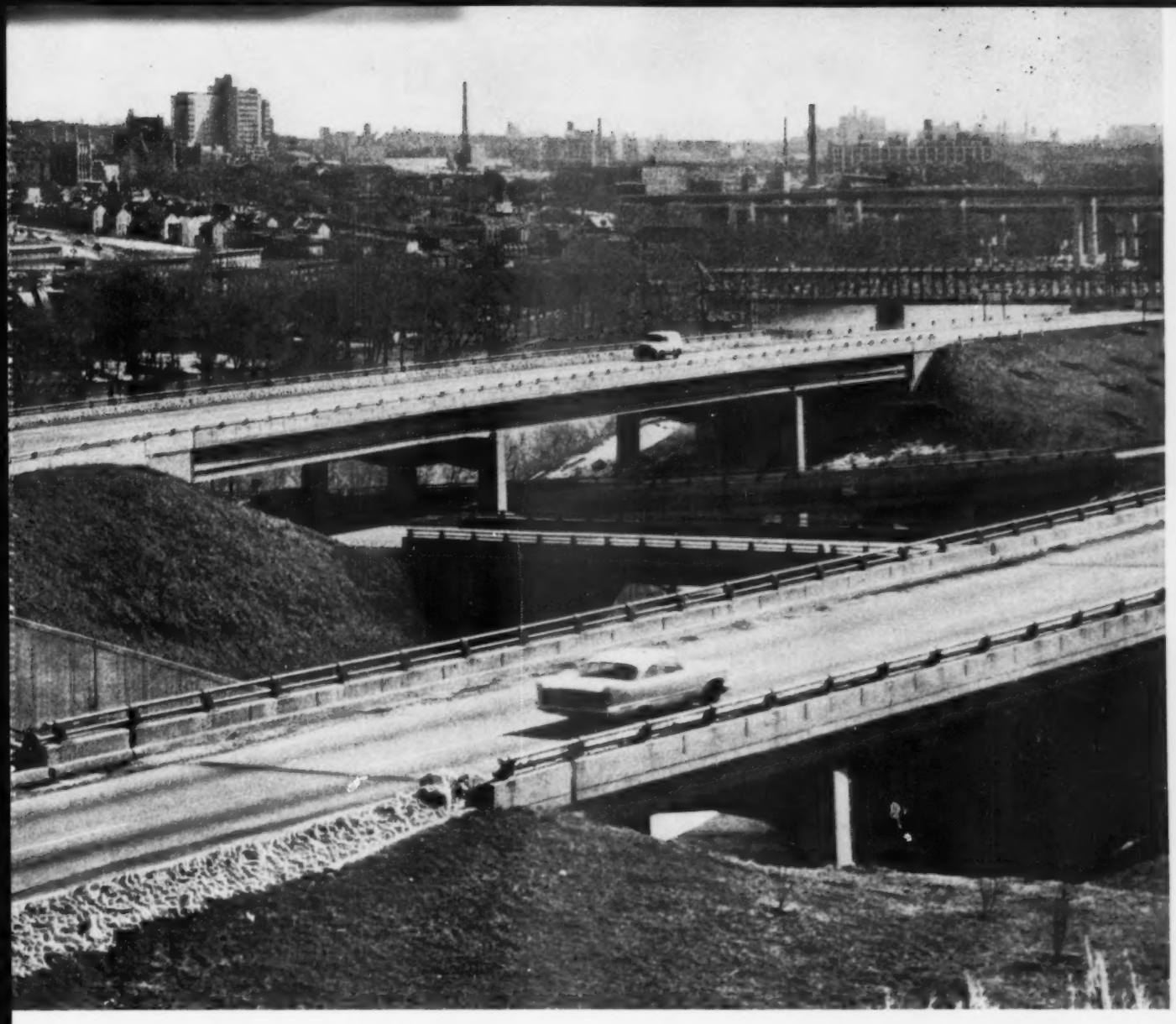
5000 bridges designed

at Michael Baker, Jr., Inc. Consulting

Michael Baker, Jr. of Rochester, Pennsylvania, heads one of the country's largest firms of consulting engineers. Since 1944, his organization has designed about 5000 bridges—five for every mile of highway they've worked on—and 98 per cent of them are steel!

In designing bridges, engineers must think of strength, safety and economy, as well as flexibility for the future—and when they think of these things, they think of steel, says Mr. Baker.

The ever-increasing stream of traffic on the highways makes it important to design bridges that can be expanded to handle this increase, yet the investment is so great that the basic structure must be good for 50 years



98% are in Steel

Engineers, Rochester, Pa.

or more. Steel structures fill both requirements well.

If a steel bridge must be demolished, in connection with the reconstruction of a roadway, the steel itself can be salvaged and used in the new structure. On low-cost jobs, this salvage feature is a most important one.

These are just a few of the reasons why steel should be used for short-span bridges. You can confidently design in steel—the material you know best, the material that offers most—knowing it will be available. For more information on the USS Structural Carbon Steels and High Strength Steels designed for bridges, write United States Steel, 525 William Penn Place, Pittsburgh 30, Pa.

USS, MAN-TEN, TRI-TEN and "T-1" are registered trademarks

USS Steel for bridge design

USS Structural Carbon Steel up to 36,000 psi minimum yield point

USS MAN-TEN (A 440) High Strength Steel 50,000 psi minimum yield point

USS TRI-TEN High Strength Steel 50,000 psi minimum yield point

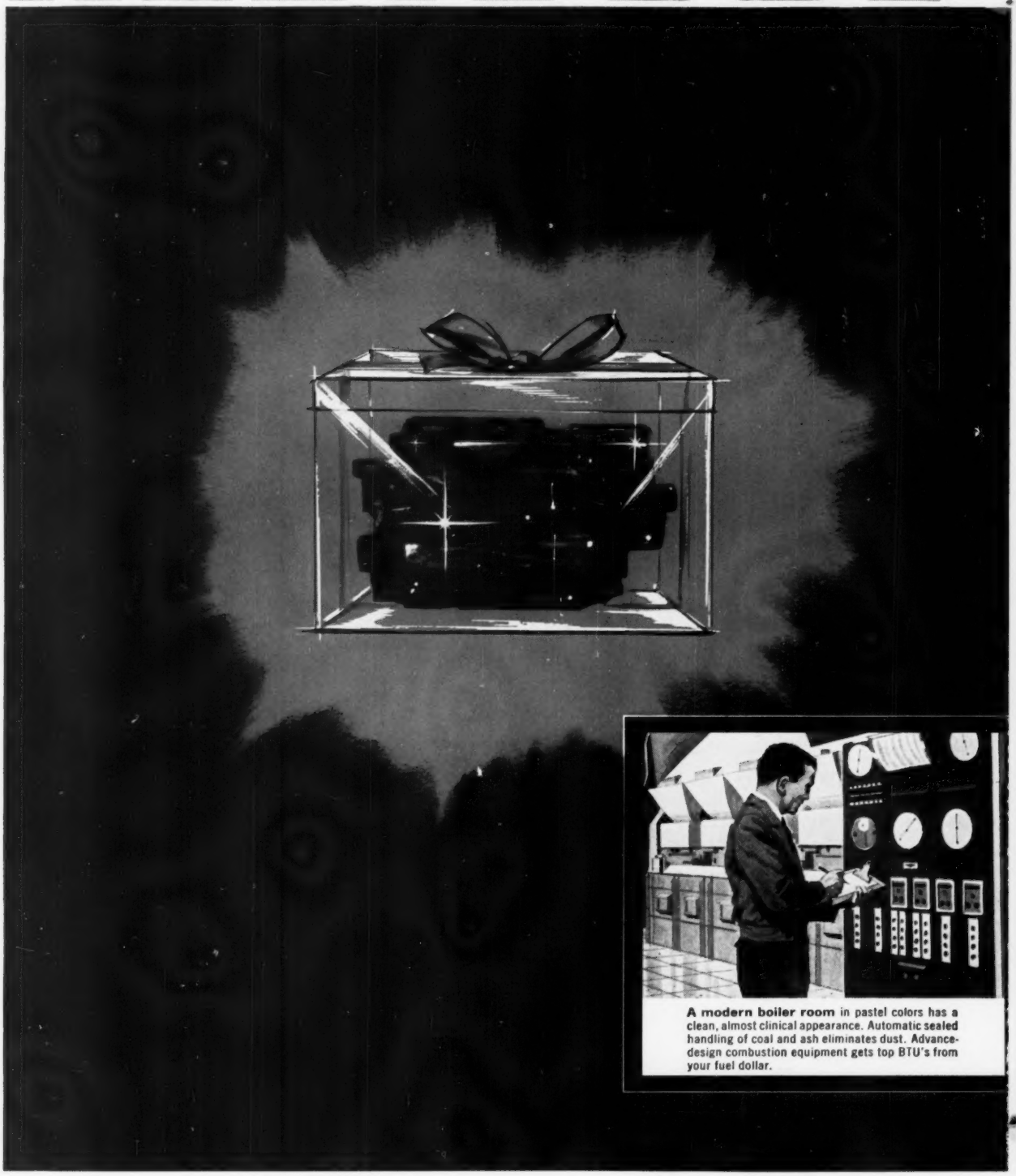
USS "T-1" Constructional Alloy Steel 100,000 psi minimum yield point

USS

United States Steel Corporation—Pittsburgh
Columbia-Geneva Steel—San Francisco
Tennessee Coal & Iron—Fairfield, Alabama
United States Steel Supply—Steel Service Centers
United States Steel Export Company

United States Steel

REDISCOV



A modern boiler room in pastel colors has a clean, almost clinical appearance. Automatic sealed handling of coal and ash eliminates dust. Advance-design combustion equipment gets top BTU's from your fuel dollar.

ER COAL !

COAL IS CLEAN because of advanced techniques in processing and combustion

The clean handling, clean burning characteristics of coal brought about by technological advances in preparation and combustion equipment, have made it an even stronger logical choice for low-cost, efficient fuel.

To provide a cleaner, more uniform product, the progressive coal mining industry has developed and installed radically new techniques in mining and preparation. More are on the way, too, as new mines become truly push-button mechanized.

Phenomenal, too, are the strides made in handling and combustion equipment. Sealed conveyor systems, dustless operation, fly ash reinjection, hydraulic ash carriers, electrostatic precipitators, and other innovations give coal a *clean* bill of health.

Through low-cost and high efficiency, coal provides more energy for your fuel dollar. Chesapeake and Ohio transports it economically from the world's finest bituminous coal reserves. Coal is the one fuel that will be available for centuries.

Chesapeake and Ohio Railway

TERMINAL TOWER, CLEVELAND 1, OHIO

Outstandability in Transportation

Coal is a good neighbor because of developments in modern equipment that offer stoker-to-stack cleanliness. Textile plants, laundries, hospitals now avail themselves of this reliable, efficient and convenient fuel.

C&O Fuel Service Engineers provide free consultation to C&O patrons on combustion, application, equipment, or plant arrangement problems. Write to R. C. Riedinger, General Coal Traffic Manager, above address.

The 5,100-mile Chessie Route directly serves over 300 mines in America's richest bituminous coal reservoir with the finest fleet of 68,000 coal cars. Specify C&O routing for dependable, efficient delivery.

CHESSIE SERVES THE COAL BIN OF THE WORLD

FLUIDICS* AT WORK

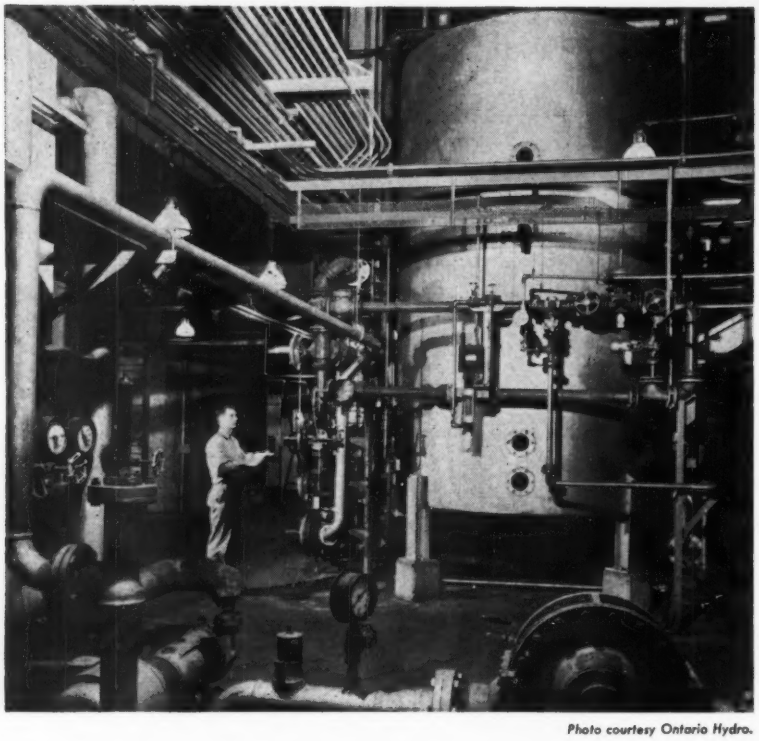


Photo courtesy Ontario Hydro.

Thirst-quencher for Ontario Hydro's largest thermal generating plant

Here almost dwarfed by its surroundings in the new R. L. Hearn Generating Station, Toronto, Ontario, this Permutit® automatic mixed-bed demineralizer helps quench the thirst of generator units 1 to 8.

This demineralizer can deliver 240,000 imperial gallons of boiler feedwater a day at a nominal flow rate of 300 gallons per minute. Total solids content of the water it produces is 4 grains per gallon. The unit can deliver water with an average specific conductivity of approximately 0.3 microohms per centimeter, and a soluble silica content of 0.02 ppm.

That is pure boiler feedwater.

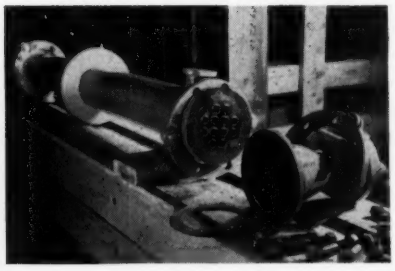
And it saves money, too. Because this Permutit demineralizer produces its high quality water at a lower cost than possible with evaporators. Still further economies are assured by its labor-saving, push-button automatic controls.

Deaerators, too. Further feedwater treatment at Hearn Station is accomplished on units 6, 7 and 8 with three of the most advanced design open direct-contact Permutit deaerators, each guaranteed to deliver 1,450,000 lb. per hour of deaerated water. Each deaerator is designed for 100 psig pressure and provides storage capacity for 28,000 gallons of deaerated water.

The Permutit Company of Canada, Ltd. supplied the demineralizing equipment for this important job. Stone & Webster Canada, Limited were the consulting engineers. Similarly, we can work with you or your consultant to help solve boiler feedwater and other water treatment problems. Our technical staff is at your disposal.

For more information, write our Permutit Division, Department CE-110, 50 West 44th Street, New York 36, New York.

In Canada, The Permutit Company of Canada, Ltd., 207 Queen's Quay West, Toronto 1, Ontario.



Why and how to get a combination heat exchanger

Suppose you want to concentrate sulphuric or nitric acid on the tube side, using high-pressure steam on the shell side. What kind of heat exchanger would you select?

Faced with this problem, our answer was a *combination*—bonnets of Glasteel, tubes and tube sheet of tantalum, and a shell of carbon steel, as illustrated above.

CHOICE OF MATERIALS. This combining materials of construction is something we are in a unique position to handle. For example, from Pfaudler you can get components made from stainless, GLASTEEL, nickel, Inconel, Monel, Hastelloy, and impervious graphite.

And now you can even get the special characteristics of components fabricated by us from titanium, tantalum, and zirconium.

OPTIMUM DESIGN. The intent of combining materials is to provide the optimum design in terms of heat transfer efficiency and corrosion resistance at the *lowest cost*.

Since our background and facilities cover this wide choice, you are sure that your needs are met with complete objectivity. Your product, your process, and your budget will point the way.

YOU'RE INVITED. What it ends up with is this invitation: Consult with us on your problem. We will then submit our recommendation on the right combination. Or get more background from our Bulletin No. 949.

BUYERS' GUIDE. Outlines our FLUIDICS program in terms of services and products for corrosioneering, water treatment, storage, agitation, etc. Send for your free copy.

FLUIDICS AROUND THE WORLD

Pfaudler Permutit is a world-wide company with manufacturing plants in:
Germany: Pfaudler-Werke A.G.
Great Britain: Enamelled Metal Products Corp. Ltd.
Canada: Ideal Welding Co. Ltd.
Mexico: Arteacero-Pfaudler, S.A.
Japan: Shinko-Pfaudler Co., Ltd.
as well as four plants in the U.S.A.

*FLUIDICS is the Pfaudler Permutit program that integrates knowledge, equipment and experience in solving problems involving fluids.

PFAUDLER PERMUTIT INC.
Specialists in FLUIDICS . . . the science of fluid processes

The Word From Washington

EDGAR A. POE, Consulting Engineer Correspondent

More Highway Criticism

Highway research abstracts, published by the Highway Research Board in Washington, say that the reappraisal of the highway program being undertaken by Congress and other official bodies has resulted in some charges of poor coordination between engineers and planners, unsound cost estimates, and extravagant design.

In its lead abstract from a paper on "Correlation of Vehicle Design and highway design," the paramount question is asked: "Can the highway engineers and the highways they design remain isolated from the many manufacturers and the private and public organizations which are dependent upon the highway systems for their very existence?" The engineering authors, Richard A. Haber and David K. Witheford, replied in part: "The operation of a transportation system of the size and scope that exists today demands the best talent and the best thinking available. Even those who may feel that this is being provided must admit that research efforts are fragmented in terms of space, time, money, and man-power. We cannot afford to have our present and future investment in the National Interstate and Defense Highway System and other networks sacrificed through a lack of coordinated thought. Yet, common sense and engineering judgment dictate that a certain percentage of highway obsolescense must be accepted to achieve transportation progress. Common sense and engineering judgment, in the short term view, suggest also that the automotive industry and road user groups should defer major vehicle modifications until the findings of the 1956 Highway Act Studies and the AASHO Road Test can be made public.

"An altogether too obvious solution to the problems which have been discussed is the establishment of further governmental bureaucracy to install controls, attempting thereby to protect the taxpayers' investment. Yet, the very nature of such an agency would tend to hamper long-range progress by restricting the competitive nature and creative thinking of a major industry and our own highway profession.

"It is believed that an acceptable alternative is an expanded research program supported jointly by industry and all other interested agencies. This suggested new research effort will require a full-time task force of workers in social and physical science disciplines as well as engineers. Equal emphasis must be given to the problems of manufacturers, users, and highway engineers."

A New Earth Manual

A new edition of its *"Earth Manual,"* successor to the 1951 edition, has been published by the Bureau of Reclamation. The manual was penned by Bureau specialists in the field of soil mechanics. It provides current technical information relating to field and laboratory investigations of soils used as foundations and materials for dams, canals, and other types of structures.

Earth Manual's preface explains that sections are devoted to problems of rolled earth dams, canals, and miscellaneous construction features. Each section presents research and information on design features and usual specifications provisions to give control personnel a background helpful in implementing the recommended control techniques.

Accurate Earth Measurement

A spectacular degree of accuracy in earth measurement, in support of the Air Force missile program, has been achieved by the U.S. Coast and Geodetic Survey.

The Coast Survey, with unprecedented precision, has succeeded in tying together a network of nine missile tracking ballistic cameras, spread over a 4000 square mile area, with the launching site at Cape Canaveral, Florida. It will permit pinpoint tracking of space missiles and flares against a background of stars.

The camera sites were calculated to within an average probable error of 0.2 feet with respect to a fixed point at Cape Canaveral, achieving an accuracy of better

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than one part in one million, or 1/16 of an inch in one mile.

Engineers of the Coast and Geodetic Survey assert that this is the greatest accuracy ever attained in a geodetic survey of any extent, and is 10 times greater than the rigid standards prescribed for first triangulation of the survey. The ballistic cameras included in the network were located from 40 to 50 miles distant from the instrumentation at Cape Canaveral. The survey involved 65 triangular stations and 200 lines in a solid area of quadrilaterals. Of these 200 lines, 43 were actually measured with the geodimeter, using its favorable characteristics of precision in measuring distances by the speed of light.

Institute of Measurement

To fill an extraordinary gap in American education, George Washington University is going to establish this country's first institute of measurement science. The National Bureau of Standards and the Martin Company of Baltimore have assured the University of financial support for the new institute. First classes will begin in February.

This gap in the American educational system was given emphasis as an outgrowth of the space age. The GW courses will include a fundamental course in metrology, measurement statistics, plus highly specialized studies in electronic, optical, and thermal measurement, including laboratory work at the National Bureau of Standards.

"Establishment of this center," said Dr. A. G. McNish, Chief of the Metrology Division of the Bureau of Standards, "is of utmost importance . . . During the past year requests from industry and government for calibration of gage blocks alone have increased from 300 to 1000 monthly. During the last fiscal year 175,000 items of all kinds were sent here."

Part of Russia's spectacular space age success is attributed by authorities in Washington to the Soviet Union's achievements in exact measurement.

Inter-American Bank

The Inter-American Bank is now ready to provide technical assistance to governments or private investors in the preparation of projects for financing. The Bank came into legal existence after 19 Latin American countries and the United States ratified the institution's articles of agreement. Cuba did not join the Bank.

Authorized resources amount to $1 billion. Of this, $850 million is ordinary capital resources and $150 million is a fund for special operations.

The entire operations of the Bank are destined to aid in further developing our neighbors South of the Border. As a result of the operations, many consulting engineers are expected to be needed to aid in blueprinting technical problems in Latin America.

The Patent Controversy

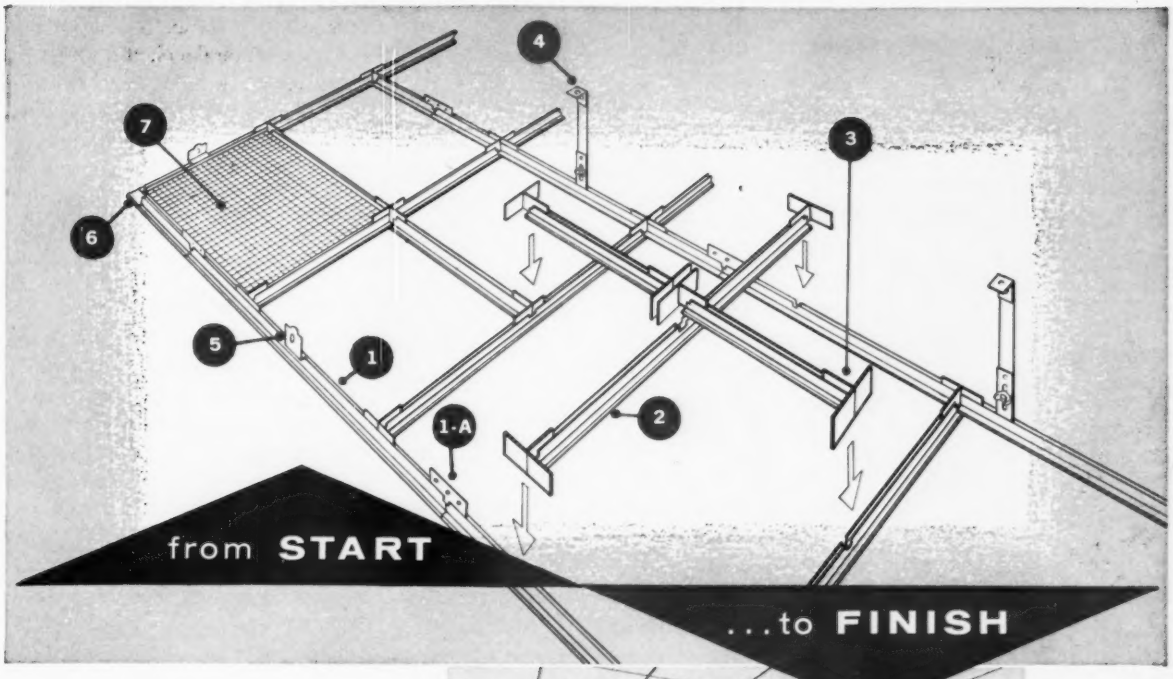
The controversy over government patent practices goes on. Still in question is whether the government or private industry should retain title to inventions developed with Federal tax money.

A Senate subcommittee on patents has completed hearings on the problem. Testimony backed both positions. No conclusions were drawn by the committee. Meanwhile, private patent surveys are underway. The whole patent controversy will probably come to a head in Congress next year.

Industry should prepare to fight for patent rights. Bills calling for government ownership of patents developed through research and development contracts are being prepared now.

Highway Contracts

Federal-aid highway construction contracts awarded by the state highway departments the first half of 1960 totaled 3762 and involved an outlay of $1.5 billion, the Bureau



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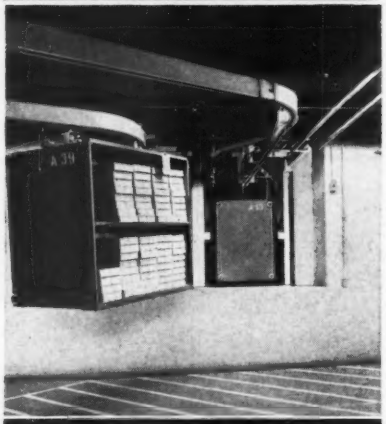

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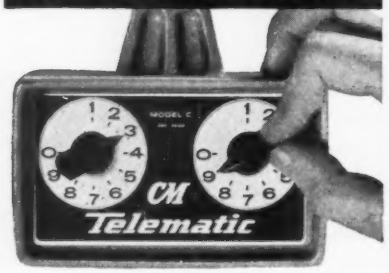

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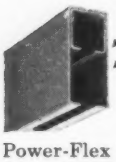

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of Public Roads says. Average cost of each contract was about $400,000, but varied from less than $25,000 to nearly $15 million.

There is now approximately 9200 miles of the proposed 41,000-mile interstate road system open for traffic. Since the inauguration of the construction of the Interstate System four years ago about $9 billion has been spent on the divided, multi-laned, stop-light free highways.

Ground Support for Missiles

Pentagon scientific advisers maintain that ground support equipment for United States missiles and space vehicles is not getting enough attention from the Defense Department.

The Corps of Engineers' chief science adviser, Gilford G. Quarles, asserts that because ground support equipment does not have the glamour of huge boosters, satellites, or space vehicles, "it often times does not receive adequate recognition from top level planners or even the systems engineers."

Quarles insists that for any successful missile or space shot, ground support is absolutely essential. Any lag in the ground support equipment program holds up the missile and space program.

Nuclear Mining

Congress may soon lend its support to the development of mining by use of nuclear explosions. A research and development subcommittee of the Joint Committee on Atomic Energy commended engineers for delving into the field of nuclear mining.

Mining by nuclear explosions, the committee reported, has the following possible approaches: Breaking and removal of overburden before the mining of the ore body is undertaken; breaking of the ore in preparation for open pit mining; breaking of ore and cap rock to facilitate block caving; and breaking of ore to permit the circulation of solutions through the broken ore in order to extract the valuable minerals chemically.

The committee emphasized, however, that "experimentation on barren rock which has the same physical characteristics as the ore bodies would have to be done first to avoid gambling with our natural resources."

Labor on the Defense

Labor unions are likely to come under still more fire next year. The coalition of Republicans and Southern Conservatives, which stopped pro-labor legislation cold in the post-convention session of Congress, is set to go to work on new labor reform laws in the next session.

Labor is going to make an all-out effort to get a Federal law passed that would outlaw all state right-to-work laws. However, the union leaders may find as many Democrats as Republicans lining up against them.

Secondary Boycott

The so-called "Situs Picketing Bill," which would permit secondary boycotts in the construction industry, will again be pushed by labor. It likely will meet with as much opposition next year as it did in 1960 when it failed to clear the committee.

Once the labor law fight starts, the entire field of labor reform will be wide open.

The Housing Surge

The Bureau of Census says a record increase of 12.5 million housing units were constructed in this country in the 10 years prior to April 1, 1960. The number compared with an increase of 8.7 million units built during the previous decade.

The total of housing units built for the 50 states and the District of Columbia from 1950 to 1960 was 58.6 million compared with 46.1 million from 1940 to 1950, an increase of 27 percent.

Housing Administrator Norman P. Mason labels as irresponsible

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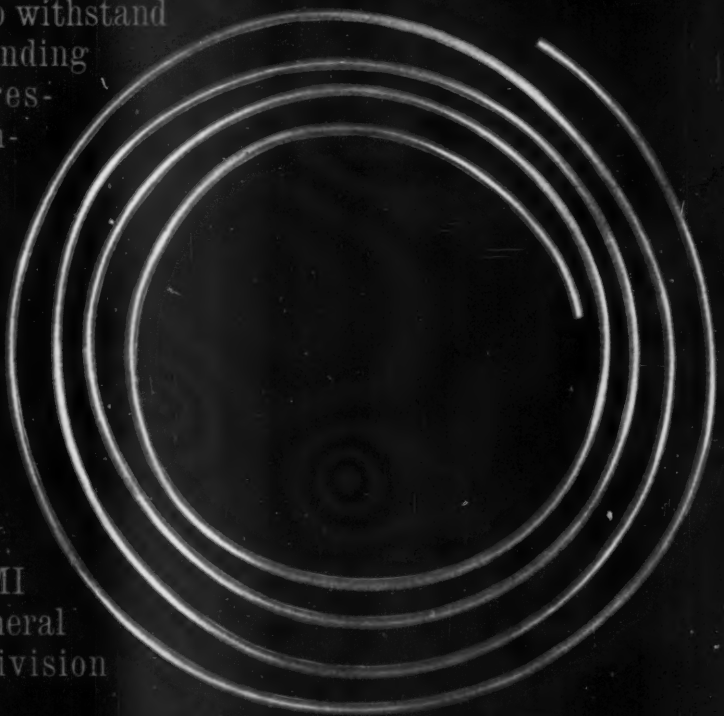
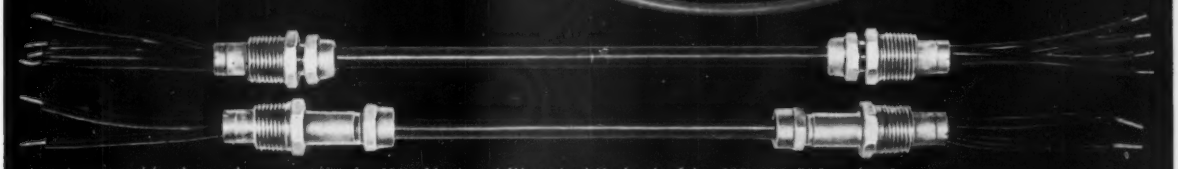




Approved for hazardous areas in the 1959 National Electrical Code, Articles 330-501, 502 and 503.

charges that the United States is lagging in home construction. Said he: "We are hearing a lot, reading a lot, about how unhealthy the housing economy is. Actually, several economic signs point to good times in the housing industry."

Inter-American Highway

The Inter-American Highway from the United States-Mexican border to Panama City, Panama, will be completed by 1962, the American Automobile Association reports. The award of contracts for 39 bridges and a now impassable 133-mile stretch of Southern Costa Rica means the last gap in the Central American system will be closed. Surface improvements are expected to be completed within a year on sections in Guatemala, Honduras, Nicaragua, and Panama.

Federal Hydroelectric Power

N. B. Bennett, Jr., Assistant Commissioner of the Bureau of Reclamation, in an address before an electric power cooperative at Madison, South Dakota, declared:

"When we contemplate future power supply in the Eastern River Basin System, we come smack up against one of the realities of life that we must face up to and live with. The situation is, frankly speaking, that the Federal government is practically out of feasible major sources for new hydroelectric power in this part of the Missouri River Basin.

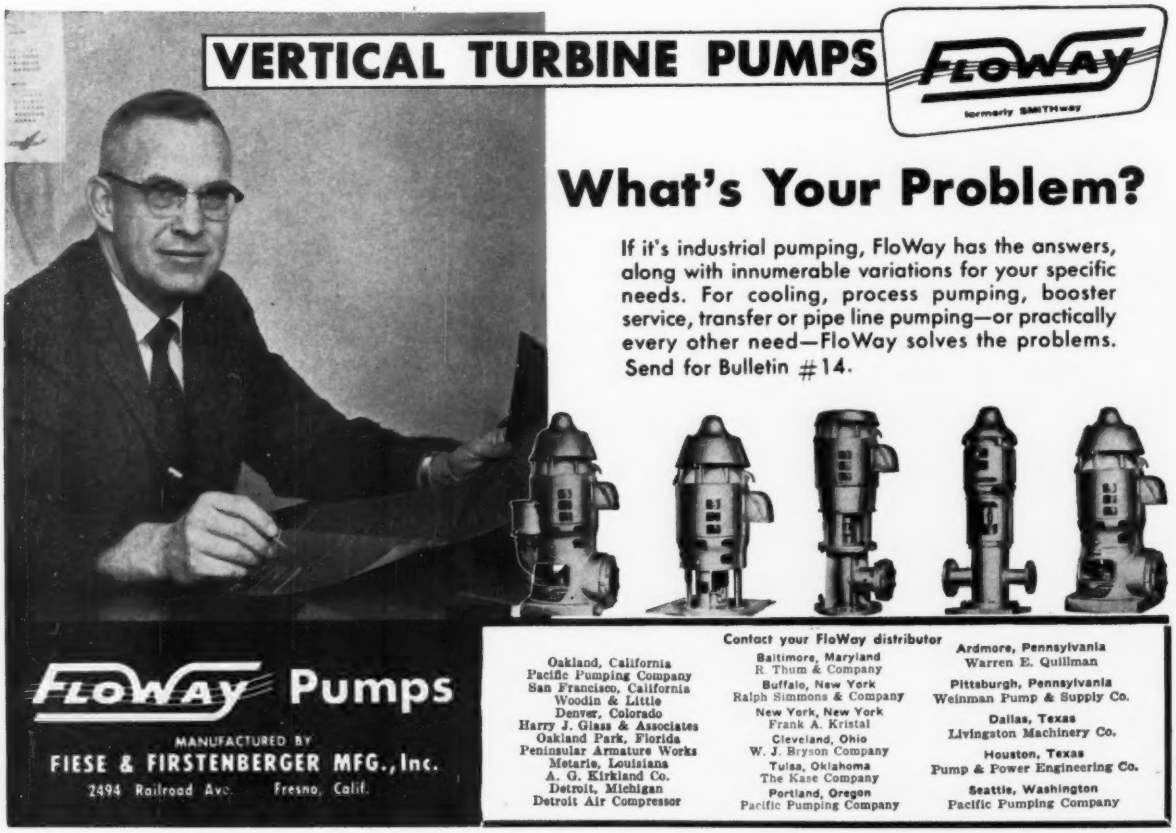
"The allocations that were made in 1959 covered all of the hydroelectric power anticipated to be available in the eastern division through 1965. The only two remaining hydroplants of significant size on the drawing boards in the Basin are Big Bend in South Dakota and Yellowtail in Montana . . .

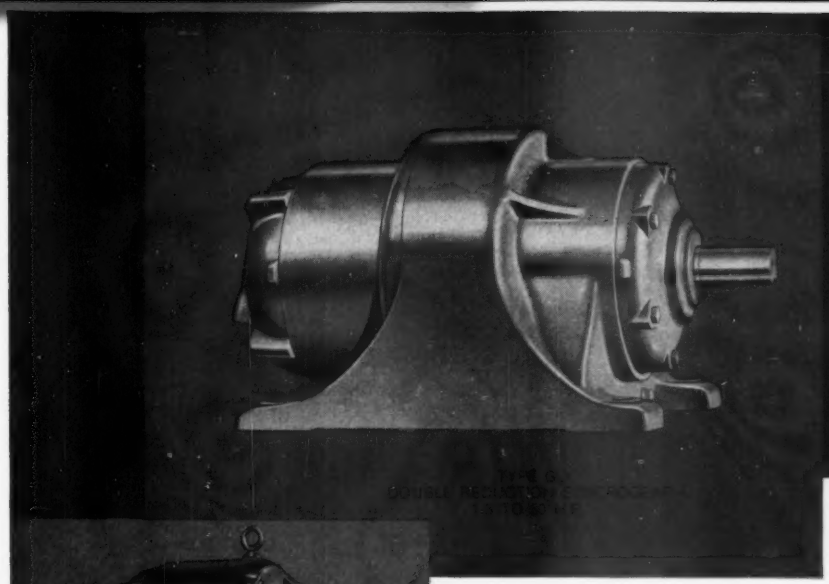
"There are some other potential multipurpose reservoirs under study for the Missouri River Basin which may or may not prove feasible, and which may or may not include power installations. The location of these sites, however, is exclusively in the Western divisions, and it is far too early to base any plans upon the possibility that they may come to fruition. In any event, the power additions from these potential projects would be relatively modest.

"Consequently, the only conclusion to be drawn at the moment, is that when the proposed Big Bend project is completed, the Eastern Division will have exhausted its major hydropower potentialties, with a total firm capability at that time of roughly 1,158,000 kilowatts. This total capacity anticipated to be available about 1965 sounds large, but actually it is only about 60 percent of the total load estimated by our preference customers."

Alaskan Hydropower

The Bureau of Reclamation's engineering and economic feasibility report on the proposed Crater-Long Lakes Division of the Snettisham Project, a single-purpose hydroelectric power development to meet





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present and future needs of Juneau, Alaska, has been forwarded to the Congress, with a recommendation that the project be authorized.

The proposed water resource project is a single-purpose hydroelectric power development designed to meet growing power requirements for municipal, domestic, and industrial purposes in the Juneau area. It would consist of a three-unit hydropower development with an installed capacity of 48,000 kilowatts capable of generating about 306 million kilowatt-hours of energy annually. The power plant would be located near the mouth of the Speel River, 28 miles southeast of Juneau. Water would be delivered from nearby Crater Lake, elevation 1022 feet, and Long Lake, elevation 815 feet, by tunnels and penstocks to the common powerhouse on Speel River.

Power generated at the plant would be delivered to Juneau over 38.7 miles of 115,000 volt transmission line. Estimated cost of construction of these works is $38.4 million, all of which would be allocated to power.

Underground Water Storage

A Geological Survey report declares that impounding floodwater at White Sands Missile Range in New Mexico and injecting it into underground storage may be a practical method of augmenting groundwater supplies in that area. Possibly as much as 2000 acre-feet of water could be salvaged during very wet years, and 200 acre-feet or more in most years.

Similar situations exist in many other places in the Tularosa basin and in similar desert valleys in the Southwest.

A proposed dam would form a reservoir having a capacity of about 1080 acre-feet (about 350 million gallons) and would catch runoff from a drainage area of about 9 square miles. The impounded water could be injected into the highly permeable part of the alluvial valley fill to recharge the groundwater reservoir. Several possible methods by which the water could be injected into the valley fill are discussed. The most promising method is through wells.

Grain Storage Consultant

The government of India plans to contract for the services of a United States firm of consulting engineers with broad experience in design and construction of food grain storage facilities.

The consulting firm will be retained in connection with the construction of facilities for India's food grain storage program. It also will be called upon to blueprint plans, specifications, and bidding documents; inspect machinery and equipment; supervise construction; and assist the Indian government in selection of suitable contractors.

The India Supply Mission in Washington, 2536 Massachusetts Avenue, is handling preliminary details of the huge program. ▲▲

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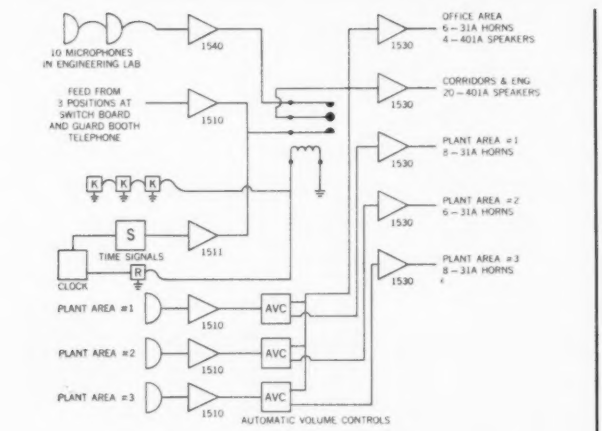

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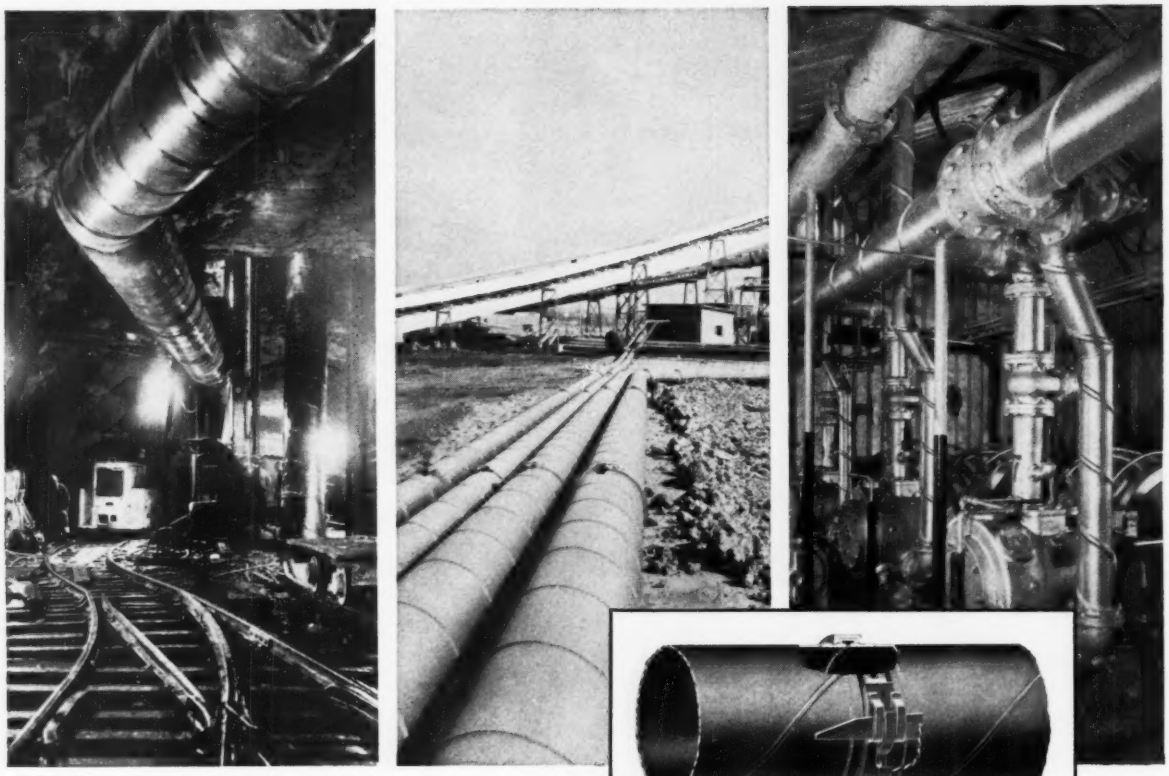

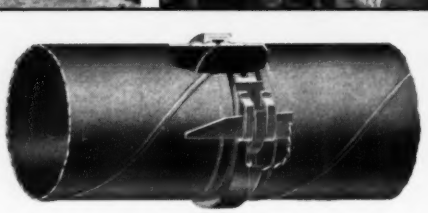

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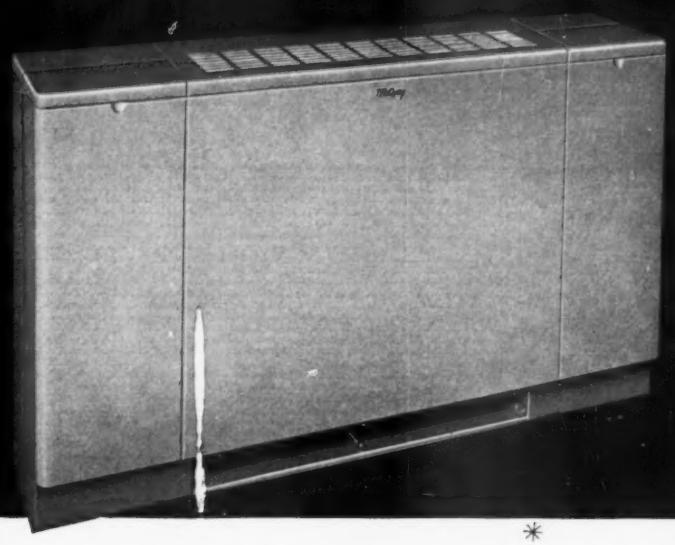

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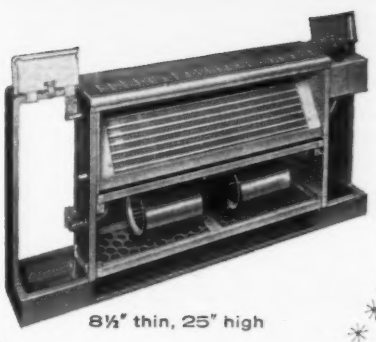

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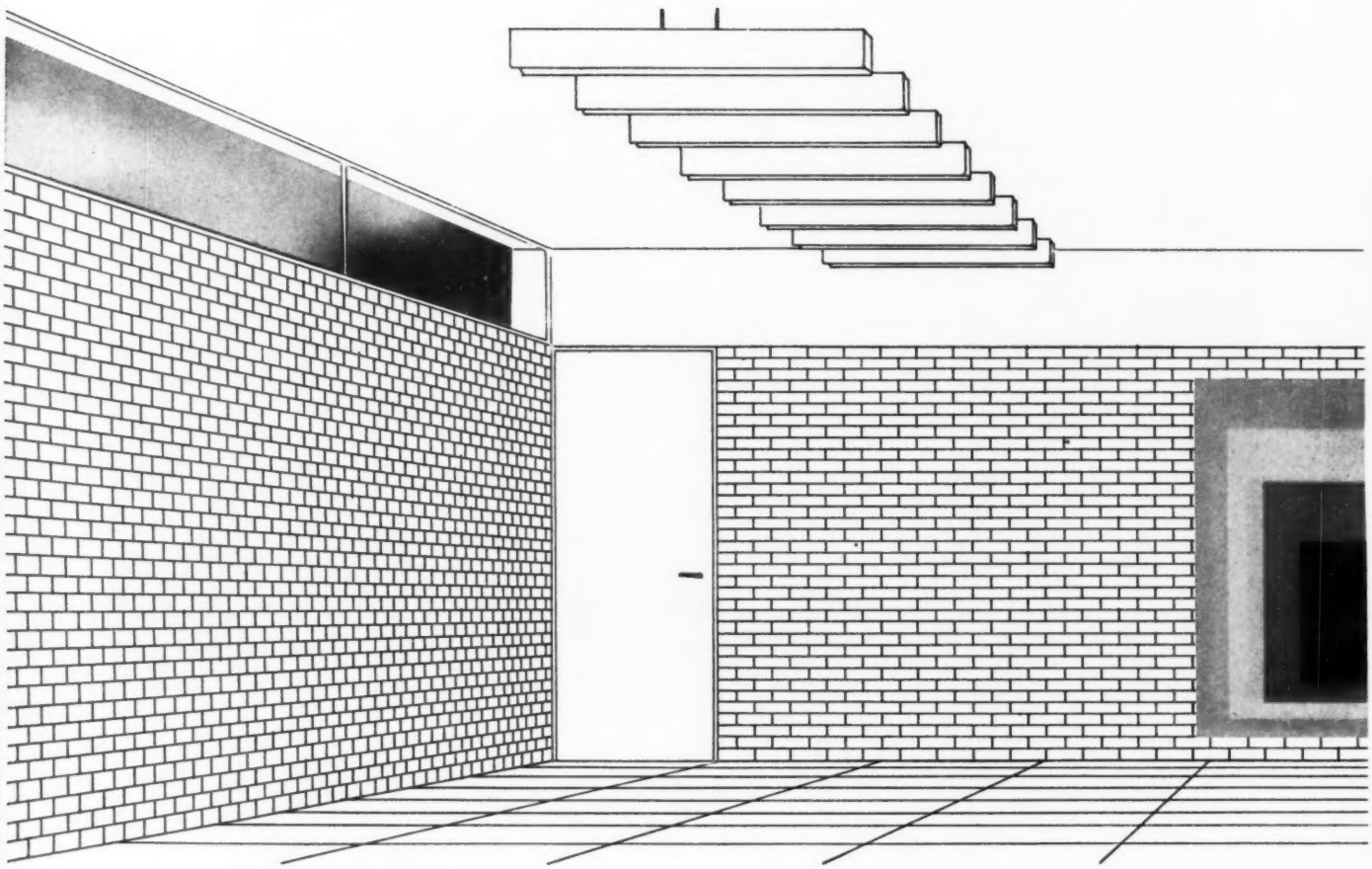

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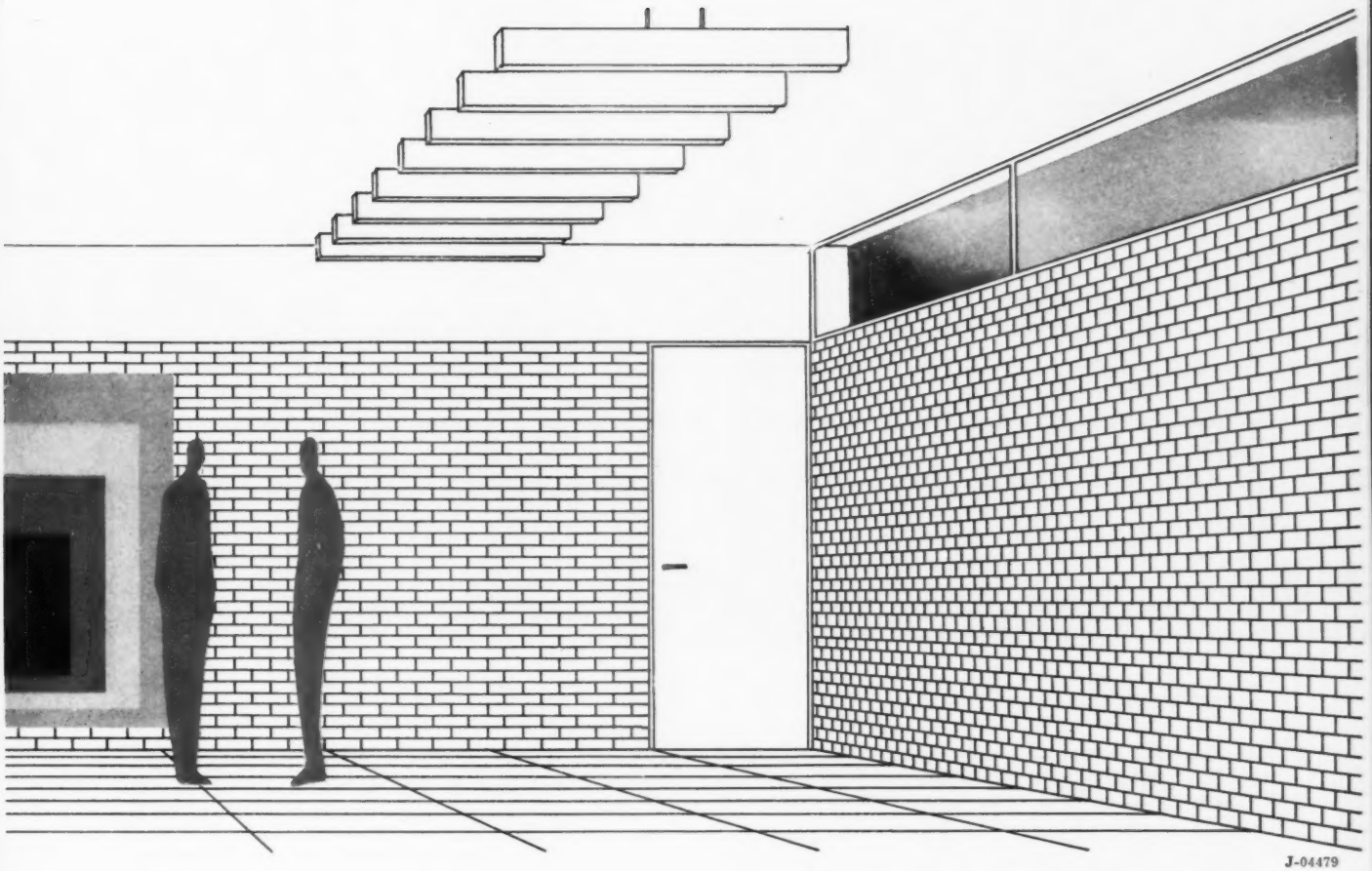
Inland Ribform

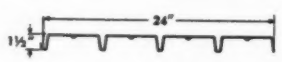


are the source of that light. They're part of the space, the room, the comfortable feeling of good design.

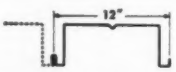
Lighting Division, Edgewater Park, Cleveland, Ohio.

Westinghouse

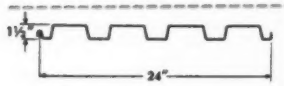
Steel deck or centering...you name it, INLAND has it!



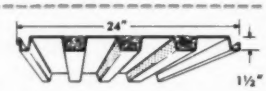
A-DECK — For purlin spacings not exceeding 8'4". Narrow ribs provide deck surface that supports the thinnest or softest types of insulation.



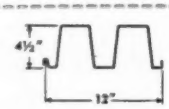
H-DECK — New! For simple spans to 20'0" — 3" and 4½" depths. Especially practical to cover walkways in shopping centers, schools, other installations.



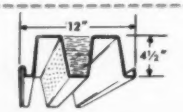
B-DECK — For spans to 10'0". Wide rib distributes metal for greater structural efficiency. Well suited for use as side wall panels.



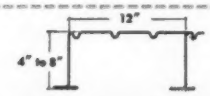
B-ACOUSTIDECK — Two-in-one panel combines steel roof deck with acoustical ceiling having Noise-Reduction Coefficient of .70. Used for spans to 10'0".



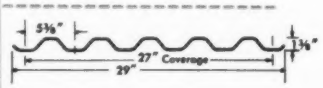
C-DECK — Carries normal roof loads over spans up to 24'0". Used extensively in canopies.



C-ACOUSTIDECK — Offers same Noise-Reduction Coefficient as B-Acoustideck. Can be used for spans to 24'0".



T-STEEL — New! Galvanized only. For clear spans to 32'0". Adaptable to acoustical and flush, luminous ceiling treatments. Provides superior diaphragm to resist seismic and wind loads.



RIBFORM — High-tensile, galvanized steel form for concrete slabs over spans up to 8'0". Three types: Standard, Heavy-Duty, Super-Duty (shown).

Expansion projects and new buildings get under cover fast and economically, when you specify an Inland roof system.

Inland steel deck is easy to handle and weld in place — in any weather that a man can work. Effects of construction abuse are held to a minimum, since types A, B, C, and H decks are Bonderized, then covered with a baked-enamel primer that resists on-the-job damage. One field coat of paint over this is usually enough.

In concrete-over-steel construction, Inland Ribform supports wet concrete with minimum deflection. Rigid sheets are quickly and inexpensively attached to supports — in place, they provide a safe work platform for crews.

Write for catalogs 240, 241, and 245 — see Sweet's sections 2c/Inl, 11a/In, and 2a/In. For help on unusual problems, you can draw on the diversified experience of Inland sales engineers. Write or call your nearest Inland office.

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INLAND STEEL PRODUCTS COMPANY

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"Quote . . . End Quote"

Profit (and Loss) Statement

". . . do not underestimate the aggressive and determined attack on the state highway departments by some of the consulting engineering interests, who charge that they can actually do the highway program engineering and construction supervision job cheaper than the states, but that the states have such a confused accounting system that the true state costs are obscured and cannot be accurately compared.

"I suggest you assemble some cost data if you do not have it readily available," advised Johnson, "for you undoubtedly will be required to have it before very long . . . I am unable to understand how the consultant can perform the services cheaper than the State if he furnishes the same level of service, since he must add promotion and profit items in his costs." — A. E. Johnson, Exec. Sec. of *American Association of State Highway Officials* at the 39th Annual Conference.

Once More, But Slower . . .

". . . Our staff includes 306 designers, draftsmen, and trainees instead of the 450 required to do all our own work. The current level will be maintained and will meet most of our design needs in the foreseeable future with the overloads going to consultants.

"The department currently has $360 million in construction under design, of which $73 million is out to 23 consultant firms: 20 are Michigan firms. This compares with $100 million in consultant design out to 12 firms in July of 1957.

"We pay consultants upwards of 3% for road design and 4% for bridge design. This does not include considerable time spent by our own coordinators who must be assigned to consultants to make decisions and expedite.

"Last year the department's own forces completed design on $94 million in road plans and $12.3 million in structure plans at a total cost of 1.95 percent of construction cost, including all costs; fringe benefits, rentals of office space, etc.

"On surveys we find the cost per mile averaging single and dual lane work was $2015 for the 799 miles completed by our own forces during the past year and $3570 per average mile for consultants employed in the past. Our costs include all costs. By eliminating surveys by consultants and increasing design work by our own forces, we have saved over $2 million.

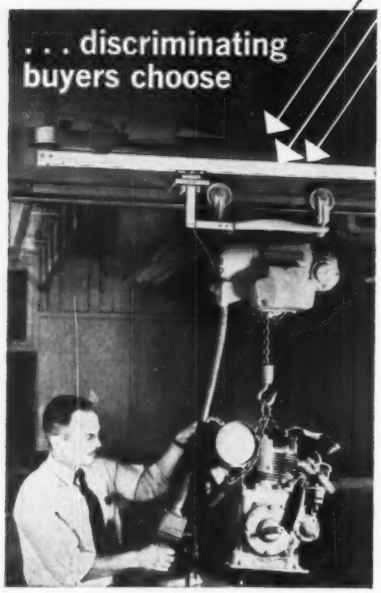
"Our policy is to engage consultants to carry peak design loads and to perform other specialized work (aerial photogrammetry, movable bridges, special major structures) where we feel consultants have more experience and knowledge than is available within our own organization. Quite frankly, our specialists in structures, soils, construction materials, and supervision are generally better qualified than the working personnel of the architect-engineer firms who have been and are now performing design and drafting work for the Highway Department." — John C. Mackie, Commissioner, Michigan State Highway Department, in *Engineering News-Record*, September 22, 1960.

The Sperry Battle

"What the union really means [re NSPE vs IUEN] is that when engineers who have experimented with unions have found them unsatisfactory to advance their goals and have sought NSPE assistance, such assistance has been forthcoming . . . NSPE's sole role when assistance has been requested is to provide information and to honestly and openly advise the engineering personnel who are to make the decision that NSPE believes that professionalism and unionism are incompatible.

"We hope that each eligible engineer at Sperry will participate in the vote and express his conscientious view. This can mean the end of bitterness, discord, coercion, and mistrust and the start of a path toward intelligent and har-

GOOD REASONS WHY...



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Crane and Hoist Electrification

The right choice of an electrical system for cranes and hoists is reflected in increased operating efficiency and lower costs. In addition to unfailing power, you need the safety to equipment and personnel given by steel enclosures. You need compactness and adaptability, a flexibility to meet electrical requirements of tomorrow as well as today. And you need a system low in installation cost, easy to maintain during the life of the crane or hoist.

That's why thousands of companies have selected FEEDRAIL Crane and Hoist Electrification Systems with the movable trolley outlets that travel right along with the crane or hoist.

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monious relations among all the engineering personnel working together." – Noah Hull, president of National Society of Professional Engineers in *Engineering Employment Practices Newsletter.*

The Soft Sell

"In every discussion of engineering ethics, bidding for assignments invariably receives its share of attention. Most codes are clear that bidding on a price basis is wrong, and most engineers agree that the practice is improper, but seldom do we hear a discussion of the reasons. Instead of talking about how to stop bidding, let's talk about why it is bad – why it is not in the public interest to engage on a price basis.

"First of all, no one has yet devised a way of preparing a specification for engineering knowledge, skill, or integrity. Only the most cynical and uninformed could believe that all engineers turn out identical results. Only a fool would buy a product on the basis of price if he had no way of knowing the quality of the product.

"Let's assume for a moment that all engineering services were to be engaged henceforth on the basis of bids. To get an assignment, then, one would have to make the price low enough to beat the others. So far so good. But now the work must be done, and if he is to stay solvent he must keep the engineering costs below the amount of the fee. That's easy enough. He just spends a little less time and thought on the design. Who suffers? First the client, of course, but eventually the entire engineering profession is down-graded, and that's the real reason competitive bidding is declared unethical.

"We will always have with us a few individuals who, for the sake of a quick buck, are willing to prostitute their profession. The medical, dental, and legal professions have them, and so, unfortunately, does the engineering profession. We won't get rid of them by preaching or pleading. The best we can hope for is to confine their activities to working for clients who really want cheap engineering instead of quality results.

"We can do this only by educating the public. We must convince prospective clients that it's not in their best interest to employ engineers on a price basis. And before we can do that we've got to know the reasons ourselves . . ." – Pres. Frank E. Alderman, the *Consulting Engineers Association of California*, Monthly Report, August 1960.

The Hard Sell

"Mr. Fischer has forged ahead by using a tactic seldom employed by consulting engineers: The hard sell. In a business where many firms sit back and wait for clients to come to them, much like lawyers or physicians, Mr. Fischer fires off barrages of direct mail ads carrying claims that 'Fischer facilities can be your stepping stone to better profits' or, 'What Fischer really engineers is more sales.' He also relies heavily on aggressive personal salesmanship and plays up his 'bargain' prices.

"All this is viewed with icy disdain by many of Mr. Fischer's fellow engineers. Says an official of an Ohio professional engineers' group: 'He fails to preserve the dignity of his calling.'

"But Mr. Fischer, whose Cleveland-headquartered H. Fischer & Associates, Inc., has performed such varied chores for clients as designing a gasoline station pump and laying out a lobster packing and shipping plant, cheerfully accepts such rebukes – and watches his business prosper.

"Mr. Fischer's advertising and promotion practices provide a prime example of his predilection for going his own way. Fischer & Associates spends about $30,000 a year in this field, with the bulk going for mailings to a list of about 4000 accounts and potential accounts. Some of the direct mail

designs for jet age with CONCRETE

...concrete meets runway needs of nation's first airport built for jets

The tremendous weight and speed of modern airliners call for a runway pavement that meets every strength and safety requirement.

Built from the ground up for jets! Dulles International Airport near Washington, D. C. will handle peak traffic day after day. Runways stretch more than two miles long. High-speed turnoffs sweep planes clear of the runway within 30 seconds of touchdown. *All runways and taxiways are designed to handle aircraft weighing up to 500,000 pounds!*

Only concrete could do the job. It's the one pavement that enables engineers to accurately design runways to match *any* traffic load. Pilots prefer concrete, too. Safety is built in. There is dependable skid resistance, wet or dry. Light color for highest visibility. A surface that stays forever flat.

And not the least advantage is long-time economy. Concrete's moderate initial cost isn't just a down payment. Upkeep costs will remain low. For airport paving, for important highways like the new Interstate System, concrete is the preferred pavement on every count.

Why concrete was specified at Dulles!

Concrete and asphalt were compared on nine engineering requirements. Concrete excelled on every count:

- Minimum acceptable life of 25 years
- Positive resistance to jet fuel spillage and jet engine blast
- Prevention of "shoving" as a result of high-speed turns
- Satisfactory performance under extremely high tire pressures
- Light-reflecting quality of the pavement
- Elimination of rutting of the pavement due to channelized traffic
- Skid resistance
- Only nominal maintenance required
- Adaptability of pavement to accommodate probable characteristics of future aircraft

FOR RUNWAYS WITH A SOLID FUTURE...
Concrete

PORTLAND CEMENT ASSOCIATION
A national organization to improve and extend the uses of concrete

ads contain price schedules and boast: 'No extras. No premiums.' One mimeographed sales aid lists engineers' salaries and fringe benefits, so the client can see exactly what some of Mr. Fischer's costs are.

"Professional engineering societies generally frown on aggressive promotion, and Mr. Fischer has been informed by one group that it is 'unethical' for an engineering firm to advertise. Such advertising as is countenanced by professional groups is usually limited to notices that do little more than list the name, address, and type of work performed by a firm. Direct mail advertising is especially unpopular with Mr. Fischer's fellow engineers. 'We don't like it,' Walter Carroll, president of the Cleveland chapter of the National Society of Professional Engineers, says of Fischer's practice.

"Mr. Fischer is also unorthodox when it comes to rates. Fischer & Associates will do a job 'for less money than other firms of our type,' he claims. 'We charge the customer payroll costs plus 60%.' By way of contrast, he asserts, 'some companies in our business charge payroll costs plus 100% or 125%.' Mr. Fischer says his lower prices are possible because he has sufficient volume to keep his engineers busy all the time, while some competitors must charge enough to cover the pay of men idle between jobs." — *The Wall Street Journal*, September 6, 1960.

On Saline Water Conversion

"Our present efforts to convert these vast reservoirs of saline water into usable form are inadequate to meet the national demand for water in the decades ahead. These efforts, though they have made progress, are small compared to the technical difficulties standing in the way of economical saline conversion. These difficulties give no promise of any dramatic breakthroughs. Rather, they require sustained research and development on a great number of engineering questions so that, as we find answers, we may gradually reduce the cost of conversion.

"We are in a race against time. For the sake of our homes, our cities and towns, our industry and agriculture, we cannot afford to delay.

"I am therefore introducing a bill to provide for an accelerated program of research and development to find economical means of converting saline water. The bill will remove present restrictions of time and money on saline development and will offer loans to communities wishing to build developmental conversion plants. I believe it will put us in a position to meet our coming water crisis . . .

"Already, the cost of converting saline water has come down sharply. Ten years ago, the cheapest we could make usable water from sea water was about $4 a thousand gallons. Now some plants can do the job for $1.75 a thousand, and a plant under construction in Freeport, Texas, is expected to cut this even more, to $1 a thousand.

"But this is not enough when you consider that most municipal water in the United States costs in the neighborhood of 30 cents per thousand gallons.

"There is every reason to believe intelligent research will bring costs down to an economical point. Indeed, already it is cheaper for some areas to convert water . . .

"Research currently centers around five main areas. They are:

"First. Distillation — an age-old process brought up to date. Great cost-cutting progress has been made in the conversion of heat and scale and corrosion control.

"Second. Solar distillation — using heat from the sun.

"Third. Membrane conversion — using a combination of thin membranes and electric currents to screen out dissolved salts.

"Fourth. Freezing — an experimental method. Frozen water crystals separate themselves from salt

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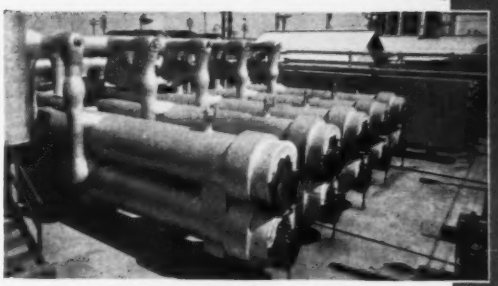
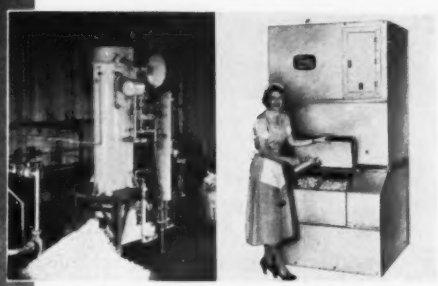
FORGED STEEL VALVES & FITTINGS FOR TOUGHNESS AND TROUBLE-FREE SERVICE

Forged from carbon and alloy steels, Vogt valves, fittings, flanges and unions are built to safely handle liquids and gases at high pressures and temperatures in the modern petroleum refinery and petro-chemical plants. The complete line includes flanged, screwed and socket weld end globe, gate and check valves—ells, tees and crosses—couplings—bushings—plugs—unions—flanges and flange unions—and weld caps.



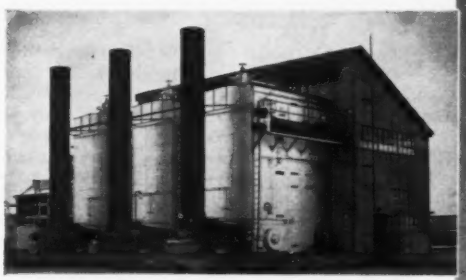
PROCESS EQUIPMENT FOR EVERY SERVICE

Vogt constructs process equipment in wide variety to all Codes. Stills and towers, oil chillers, crystallizers, heat exchangers, molding machines, etc., serve in the manufacture of oils, greases, 100 octane gasoline, synthetic rubber, chemicals and related products around the world.



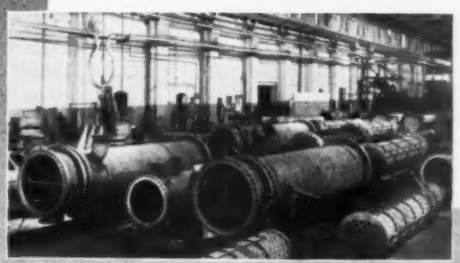
MORE REFRIGERATION TONNAGE AT LESS COST

More than 70 years of engineering and manufacturing experience is incorporated in Vogt refrigerating and ice making equipment. Compression Systems and Tube-Ice Machines in a wide range of capacities serve industrial and processing plants and institutions here and abroad.



HIGH EFFICIENCY STEAM GENERATORS

Vogt steam generators are designed to give maximum rating in a minimum of space, with high efficiency and low maintenance expense. Bent tube and straight tube designs are available for solid, liquid or gaseous fuels to meet every power, process or heating requirement.



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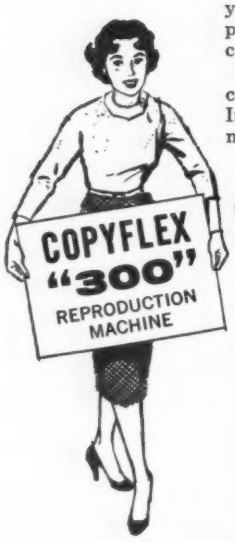
The Bruning "300" is clean, quiet, odorless. And anyone can operate it. It needs only a 115-volt AC connection. Investigate the savings you can make with the "300" by mailing the coupon below.



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crystals, and researchers are trying to find ways to remove the salt from the ice.

"Fifth. Other chemical and electrical methods — using gas hydrates, controlled absorption, and other experimental means.

"The bill calls for additional research, process development, the construction of demonstration plants, coordination of research at home and abroad, and sponsorship of cost studies. It also contains provisions for Federal assistance for constructing conversion plants. Appropriations suggested in the proposed bill would amount to about $17,500,000 for the fiscal year 1961." — Lyndon B. Johnson, in the *Congressional Record*, May 16, 1960.

Smoke Over Manhattan

"In the cosmic scale of values it was a small point, but Premier Khrushchev of the Soviet Union was right for once when, as his arriving ship passed the Consolidated Edison East Fourteenth Street power plant, he said he saw too much black smoke pouring from the stacks. They order things better in Russia, he said, by getting rid of the air pollution problem through conversion from coal to natural gas to generate electricity. It is disconcerting to be in agreement with Premier Khrushchev. But, like him, we also dislike smoke. Consolidated Edison said: 'Sure, we're having smoke trouble at the East River plant. We've been having trouble for years.'

"Consolidated Edison would like to buy more natural gas for power production, and is in the Supreme Court of the United States trying to get more, over the objections of the Federal Power Commission, in an issue too complicated for elaboration here. But use of natural gas to make power is not a Russian first. In the United States such use goes back about twenty years, and in 1959 25 percent of power produced nationwide was from gas as fuel . . ." — *The New York Times*, September 22, 1960. ▲▲

Spang Headerduct will feed electric, telephone and intercom wiring into floor cells on 28 of the 32 floors at First City National Bank Building, Houston, Texas. This will provide service wherever it's needed and permit speedy changes to meet any future requirements.

In 1990 this Spang Headerduct wiring system will be as modern as it is today!

Houston's new First City National Bank Building is prepared electrically for any future requirements

Nobody knows what kind of electrical service the tenants of First City National Bank Building, Houston, Texas, will need in the year 1990. But this new building will be able to handle their requirements through this SPANG Headerduct system.

Over 31,000 ft of SPANG Headerduct have been installed from the second through 29th floor of the 32-story building to carry electric power, telephone and intercom wiring under the floors.

Future wiring requirements can always be made quickly, because the wiring is accessible by removing the SPANG Headerduct access box covers. This eliminates costly digging into concrete, repairing and redecorating. Cellular floor cells carry the wiring from the headerduct to all parts of the floor at regular intervals, providing convenient wiring service wherever it's needed.

PLAN FOR THE FUTURE WITH SPANG

SPANG Underfloor Duct systems help builders stay modern longer. The engineered design of these products simplifies installation and assures a lifetime of satisfactory service. To suit your requirements, you have a choice of Standard Underfloor Duct, Double-Capacity Duct and Headerduct—plus a complete range of service outlet fittings. For complete information mail the coupon below.

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General Contractor: W. S. Bellows Construction Corporation, Houston, Texas
Electrical Contractor: Fischbach & Moore of Texas, Inc., Houston, Texas
Spang Distributor: Graybar Electric Company, Houston, Texas

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Please send me a copy of Bulletin No. 491 entitled "SPANG Underfloor Distribution Systems."

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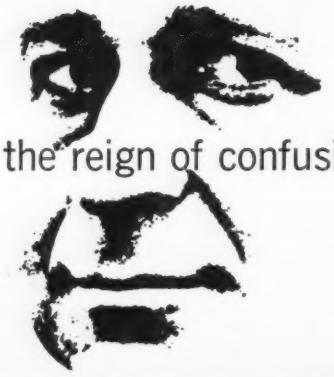
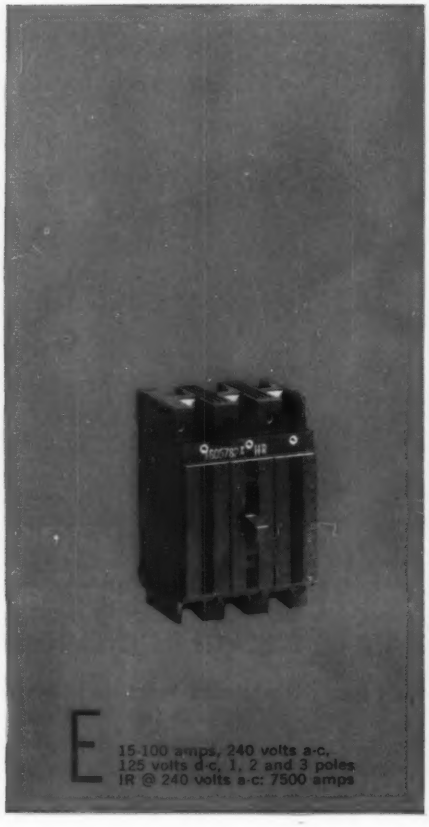
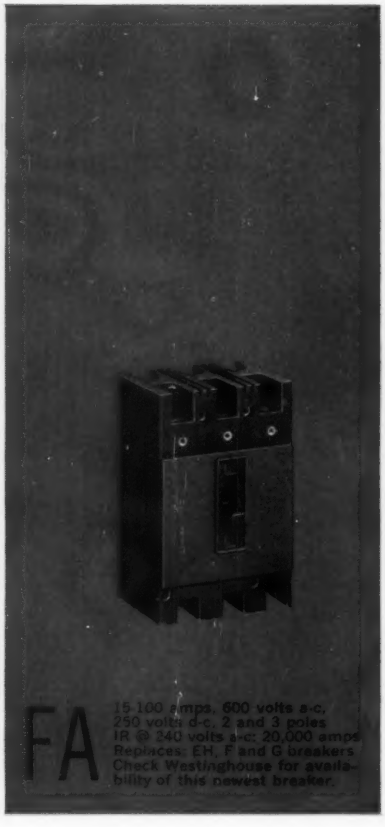


the reign of confusion is over



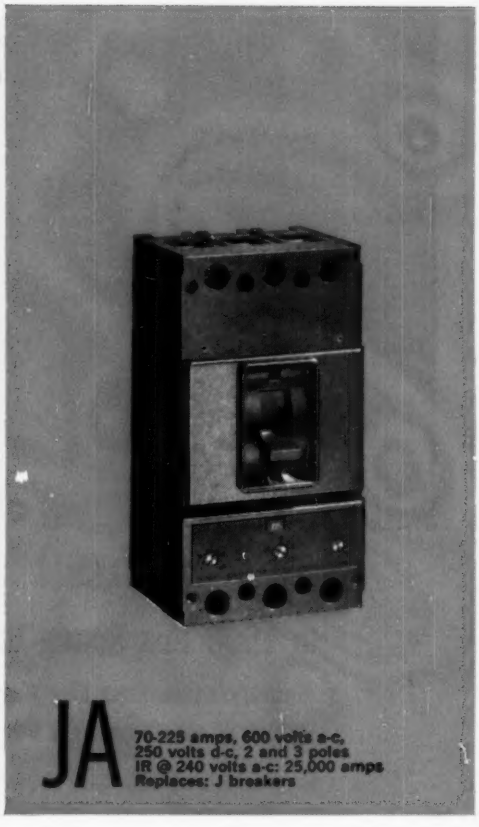
E

15-100 amps, 240 volts a-c,
125 volts d-c, 1, 2 and 3 poles
IR @ 240 volts a-c: 7500 amps



FA

15-100 amps, 600 volts a-c,
250 volts d-c, 2 and 3 poles
IR @ 240 volts a-c: 20,000 amps
Replaces: EH, F and G breakers
Check Westinghouse for availability of this newest breaker.



JA

70-225 amps, 600 volts a-c,
250 volts d-c, 2 and 3 poles
IR @ 240 volts a-c: 25,000 amps
Replaces: J breakers

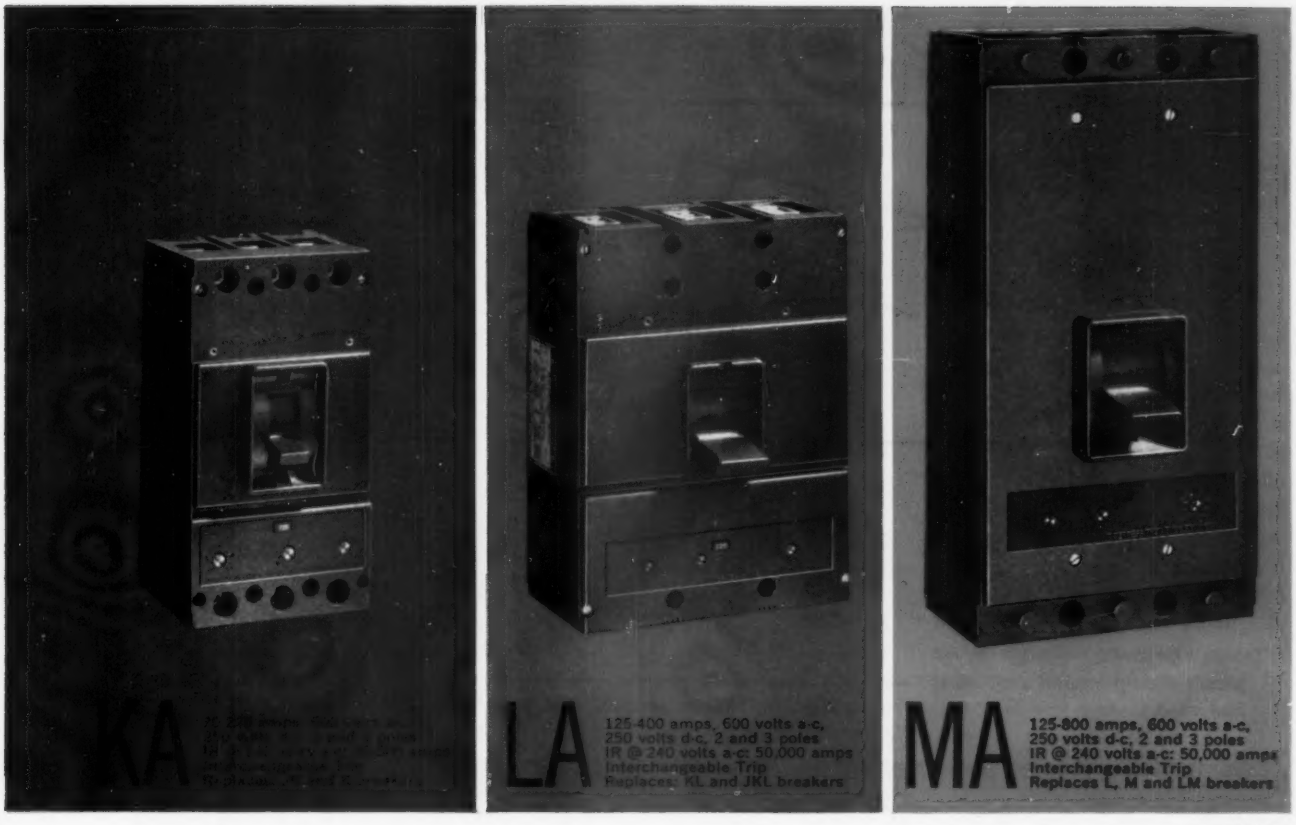
Newly Designed Westinghouse Breakers

The confusing assortment of letters that tagged the breakers of the past should trouble you no more. The reason: clear-cut designations for the new smaller size Westinghouse breaker family.

New designations mean that specifying is simple . . . identifying each breaker is easy.

High interrupting ratings in smaller frame sizes mean you save as much as 50% on space.

The Westinghouse design means that you have extra-long life, unfailing reliability.


LA
125-400 amps, 600 volts a-c,
250 volts d-c, 2 and 3 poles
IR @ 240 volts a-c: 50,000 amps
Interchangeable Trip
Replaces KL and JKL breakers
MA
125-800 amps, 600 volts a-c,
250 volts d-c, 2 and 3 poles
IR @ 240 volts a-c: 50,000 amps
Interchangeable Trip
Replaces L, M and LM breakers

J-30320

Are Simple to Specify/Easy to Identify

Any way you look at it, the NEW Westinghouse breakers are the ones you'll want to use.

More information? Contact your nearest Westinghouse representative, Westinghouse distributor, your independent panelboard builder . . . or write Westinghouse Electric Corporation, Standard Control Division, Beaver, Pa.

For a large, plastic laminated wall chart of the new breaker line, write Westinghouse.

All Westinghouse AB breakers meet or exceed NEMA and UL specifications.

You can be sure . . . if it's Westinghouse

for this type service . . . specify this **STRONG** *trap:*

Dirty Lines or Dirty Steam:

Lowest Initial Cost per pound capacity:

Lowest Initial Cost per pound weight:

Eliminating Large Volumes of Air:

Low Pressures with some air elimination:

Pulsating or Widely Varying Pressures:

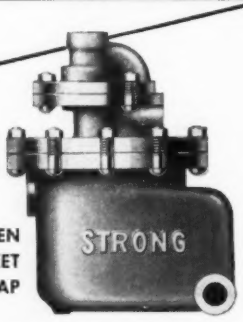
Continuous flow required:

Draining a line carrying a vacuum discharging to atmosphere:

Draining a line carrying a vacuum or very low pressure discharging against a hydrostatic head or back pressure:

HYDRO-FLEX INVERTED BUCKET TRAP

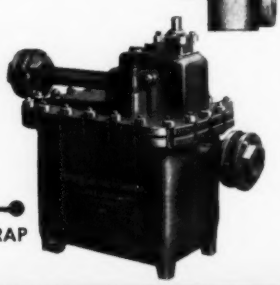
FLOAT & THERMOSTATIC TRAP



OPEN BUCKET TRAP

BALL FLOAT TRAP

TYPE "A" VACUUM TRAP



TYPE "M" VACUUM TRAP

on every type service

STRONG steam traps give you longer life, less maintenance

Strong offers six types of steam traps to answer every requirement for removing condensate from all types of systems.

You can specify these Strong Traps with the assurance that you will get maximum service life. Proof is the fact that replacement parts are still being ordered for traps sold 50 years ago!

Here are some low maintenance features built into Strong Traps. Screwed-in, replaceable valves and seats of wear-resistant ANUM-METL. Deep-drawn, one-piece stainless steel buckets. Extra-heavy body and cover construction. Thorough testing. Interchangeable parts.

You will be money and years ahead when you specify Strong Traps. For further information, contact your local Strong distributor — he carries complete stocks and replacement parts, offers prompt service.

Selector Chart in Strong Catalog No. 69A gives trap recommendations for 45 types of equipment. Write for your copy or call your distributor.

4/S

STRONG, CARLISLE & HAMMOND

508 Sandusky Street • Conneaut, Ohio

steam traps • air traps • float traps • vacuum or pumping traps
F and T traps • continuous blowdown valves • separators • engine stops

The High Spots

Industrial Building Show

Engineers, architects, and representatives from many of the nation's leading industries will address sessions of the first Industrial Building Exposition & Congress at the New York Coliseum, December 12 through 15. At the same time, about 100 exhibitors will set up displays of products, equipment and services for industrial buildings of all types.

In all, 61 speakers will address the meeting, including Oscar Bray, of Jackson & Moreland, Boston; Albert Martin, Jr., of Albert Martin & Associates, Los Angeles; George Miehls, of Albert Kahn Associates, Engineers & Architects, Detroit; Raymond Epstein, of A. Epstein & Sons, Chicago; and Eero Saarinen, architect. Topics will include construction of new facilities as well as modernization and expansion of existing plants.

The exhibits will be divided into eight major categories: structural; mechanical; electrical; heating and air conditioning; employee services; plant sites and transportation, power, and water; financial services; and auxiliary services.

The show and conference are the first ever staged to meet the needs of companies planning expansion or modernization of industrial plants. Information and registration, including hotel accommodations, are being handled by Clapp & Poliak, Inc., 341 Madison Avenue, New York 17, New York.

Demand for Engineers Drops

The demand for engineers and scientists, as measured by recruitment advertising, dropped 13 percent in the first part of the third quarter of this year, according to a survey made by Deutsch & Shea, Inc., New York. This sharp drop, reflected in the ads placed in the country's leading technical journals, appears to represent the expected seasonal fall-off during the summer months.

Despite the drop, there were some 7000 ads placed in the leading 27 newspapers in the period measured, an indication that there is still a heavy demand for engineers in the country.

New Kentucky Road

The Kentucky Highway Commission has retained nine consulting engineer firms to plan and design a new four-lane, 120 mile toll road across the western end of the state. The engineering phase of the work is expected to be completed by next spring or early summer.

The new toll road will cover the same area that is now served by Route 62, although the consultants will be free to follow whatever course they consider best, regardless of the present road. Total cost of the project has been estimated at $70 million. The general consultant, Brighton Engineering Company, of Frankfort, Kentucky, will receive a fee of 1 percent of the total cost.

More Concrete for Chicago

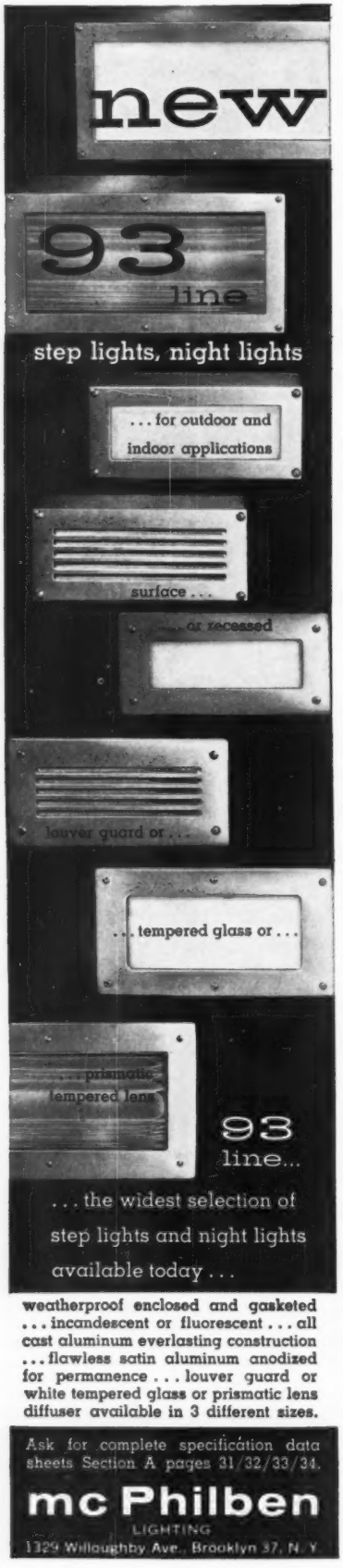
Chicago's Commission of Buildings has approved the use of prestressed concrete for various types of construction, excepting industrial plants where there is the risk of intense fire. The Commission's decision came after an advisory committee report and study of reports from Underwriters' Laboratories in England, Holland, and the United States. Under the new ruling, the minimum concrete coverage surrounding the steel must be between 1½ and 2 inches.

Prestressed Concrete Analysis

Felix Kulka, a structural engineer with T. Y. Lin and Associates, has announced the development of an electronic computer method of analyzing prestressed concrete. The new method, which cuts computing time from three hours to about one minute a section, will be applied primarily to the design of prestressed concrete lift slabs.

Kansas City Power Conference

The Kansas City, Missouri, Section of the American Society of Civil Engineers is sponsoring a Power Conference, the 10th and 11th of November, in Kansas City. Conventional and nuclear power gen-



weatherproof enclosed and gasketed ... incandescent or fluorescent ... all cast aluminum everlasting construction ... flawless satin aluminum anodized for permanence ... louver guard or white tempered glass or prismatic lens diffuser available in 3 different sizes.

Ask for complete specification data sheets Section A pages 31/32/33/34.

mc Philben
LIGHTING
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eration will be discussed by a group of distinguished engineers, including R. N. Bergstrom, of Sargent & Lundy, Chicago; W. L. Patterson, of Black & Veatch, Kansas City, Missouri; and A. F. Hartung, of Burns & McDonell, Kansas City, Missouri.

Art in Engineering

The latest work by the American sculptor Abbott Pattison shows two soil engineers at work. The bronze figure, displayed by Soiltest, Incorporated, Chicago, Illinois, is described as artist Pattison's tribute to kindred workers with earth. The smallest of the figures is holding a pocket penetrometer, his partner in the middle is holding a strength testing penetromemter, and the remaining large assembly represents the engineer's drilling and soil sampling tools.

Television for Sewers

A transistorized television camera has been designed, which, with its own light source and waterproof case, will fit into a 4-in. pipe. The new camera has already proven valuable in pinpointing leaks in underground piping.

The entire unit is fed into the pipe containing the suspected leak. The amount of cable is measured as it is laid out, and when the camera spots the leak, the length of cable pinpoints it for repair crews. Enormous savings have been reported with this method, as leaks are found more quickly and located exactly, minimizing the necessary excavation.

Rapid Transit in Los Angeles

The consulting engineering firm of Daniel, Mann, Johnson & Mendenhall has completed a 10-month study of metropolitan Los Angeles' transportation problem, and recommended overhead electric trains as the most practical solution. A 75-mile route was proposed, joining downtown Los Angeles with Covina, Santa Monica, Long Beach, and Reseda. Cost of the system was estimated at between $529 and $614 million, the difference depending on the proportion of the line that would have to be run underground.

Estimates also were given for supported and suspended monobeam systems: supported monobeam at about the same cost as the electric trains; suspended monobeams at about $120 million more.

Principal factors in considering routes were service, community acceptance, land use, obstacles, available right-of-way, and cost.

Engineering for Earthquakes

Under the joint sponsorship of the Science Council of Japan and the Japan Society of Civil Engineers, the second World Conference on Earthquake Engineering was held this summer in Tokyo, with about 450 delegates from 27 countries attending. The first Conference on Earthquake Engineering, held in 1956, at Berkeley, California, drew delegates from only 16 countries.

The design and adaptation of earthquake resistant structures was the major topic of the more than 100 papers presented at the week-long meeting. There was also considerable discussion on location of buildings in potential quake areas; determination of quake-resistance in existing buildings; and seismic effects from nuclear explosions.

The proceedings of the Conference, including the text of all papers, will be available in three volumes from the Intelligence Section, Science Council of Japan, Veno Park, Taito-ju, Tokyo, Japan. Cost of the set is $17.

Salt Stabilization

The use of salt for road stabilization is covered in detail by a new booklet distributed by the Salt Institute. Design and materials, construction procedures, and maintenance and equipment needs are discussed, in addition to case histories showing the successful use of salt stabilization throughout the U. S. and Canada. Copies of the

. . . Cochrane's experience with water helps to harness the atom

On land or sea, one of the essentials in converting atomic energy into usable power is ultra-pure water. Steam generation, reactor cooling, decontaminating of radioactive wastes and many other applications require special water treatment plants.

Cochrane was able to draw on nearly a century of experience in industrial water conditioning to meet the needs of the first atomic power plants. Increasing skills in nuclear applications are now making possible the solution of new and complex water treatment problems, including the automatic filling, emptying, and operation of complete demineralization or de-ionizing systems by remote control.

An indication of Cochrane's contribution to nuclear power development is given by the following list of projects undertaken since 1953:

Uranium Manufacture
3 Demineralizers
4 Filters
1 Deaerator

Experimental Work on Nuclear Reactors
1 Zeolite Softener
1 Acid Feed
1 Decarbonator

Nuclear Aircraft Development
2 Demineralizers

Nuclear Ship Propulsion
2 Demineralizers

Pressurized Reactor Tests
3 Demineralizers

Nuclear Ship Fleet Escort
2 Demineralizers

Nuclear Test
1 Vacuum Deaerator

Nuclear Ship Reactor Prototype
1 Deaerator

Nuclear Ship Fleet Escort
2 Deaerators

Nuclear Test Work
1 Vacuum Deaerator

Nuclear Tests
1 Vacuum Deaerator

Nuclear Aircraft Carrier
4 Marine Deaerators

Nuclear Destroyer
1 Marine Deaerator

Nuclear Destroyer
2 Marine Deaerators

4 Public Utilities
Demineralization Plants

Nuclear Research in Italy
6 Demineralizers
2 Zeolite Softeners

Nuclear Submarine Tender
3 Demineralizers

Nuclear Submarine Tender
3 Demineralizers

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COCHRANE WATER CONDITIONING LIMITED, Toronto, Montreal, Edmonton, Canada

POTTSTOWN METAL PRODUCTS DIVISION Custom built carbon steel and alloy products

Demineralizers • Zeolite Softeners • Hot Process Softeners • Hot Lime Zeolite Softeners • Dealkalizers • Reactors
Deaerators • Pressure Filters • Continuous Blowoff Systems • Condensate Return Systems • Steam Specialties

publication are available without charge from the Salt Institute, 33 North LaSalle Street, Chicago 2.

Basic Materials Research

The Advanced Research Projects Agency has selected three sites for basic materials research centers, to study properties and behavior rather than to develop new materials. The three centers will be located at Northwestern University, Cornell, and the University of Pennsylvania.

The ARPA, a branch of the Defense Department, will give Northwestern about $3½ million over the next four years to finance initial construction. After that, work at the center is expected to continue on a budget of slightly over $2 million a year, to be provided by combined private and government sources.

Specialized areas to be studied at the Northwestern center will include metallurgy, ceramics, solid-state physics, chemistry, solid-state mechanics, surface phenomena, and polymer science. Eighteen special laboratories will be included in the research center.

Industrial Finance Plan

Oklahoma has joined the ranks of states which provide industrial financing assistance with the passage of a constitutional amendment creating a state industrial financing authority. The plan, approved in Oklahoma, is similar to that now used by Pennsylvania. It will supplement private capital and local industrial foundation money with state funds, providing a 100 percent financing package for new industrial buildings. The new industrial financing assistance program will be administered by the Oklahoma Department of Commerce and Industry.

Peru's Big Loan — Chile's Airport

The proposed large land development program in Peru has not advanced far enough to determine whether or not United States consulting engineers will be employed. The Export-Import Bank and the Development Loan Fund have granted allocations of $28 million and $25 million respectively, for the major land development in the Latin American country. A spokesman for the Development Loan Fund said that if the Peruvian government feels that it needs outside engineering assistance, it will negotiate with consulting engineers.

Thus far there has been no negotiation. The DLF spokesman said "our only interest in a consulting engineering firm is whether or not the firm that is selected can adequately do the job on schedule."

The Development Loan Fund spokesman also pointed out the Chilean government has made no selection of a consulting engineering firm in connection with the proposed construction of a new commercial international jet airport near Santiago. The Fund authorized a $10,500,000 loan to Chile to help finance the construction. ▲▲

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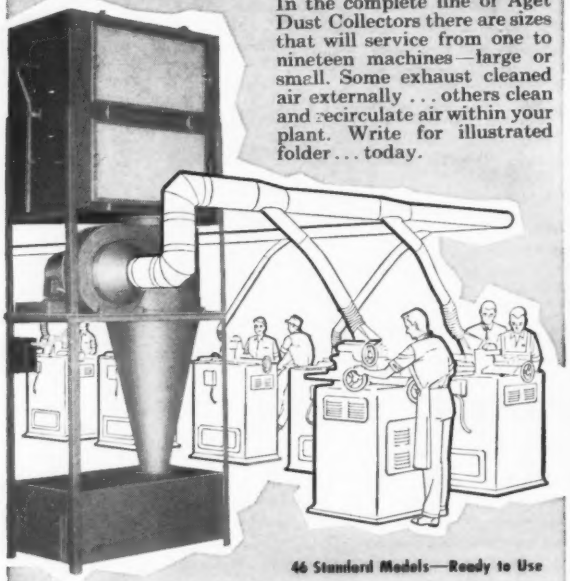
In the complete line of Aget Dust Collectors there are sizes that will service from one to nineteen machines—large or small. Some exhaust cleaned air externally . . . others clean and recirculate air within your plant. Write for illustrated folder . . . today.



46 Standard Models—Ready to Use

AGET manufacturing company
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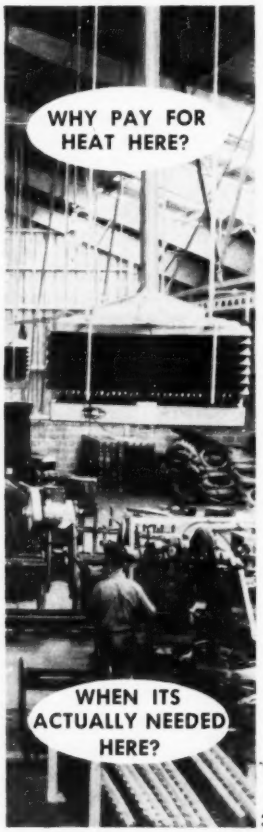


Overhead Gas-fired
PANELBLOC
Puts Heat Where It Is Needed -- in The Working Area

Panelbloc infra-red radiant heaters actually "Heat Like The Sun." Heat waves radiate downward, warming everything in their range — floors, furniture, machinery or people. Panelbloc heats the floor first.

Panelbloc uses any commercially available gas for fuel. No fans, no blowers, no moving parts mean nothing to wear out. Panelbloc heat is automatic — no electrical connections needed.

Write for Bulletin PC 1-60 J today

PANELBLOC DIVISION
The Bettcher Mfg. Corp.
3106 West 61 St., Cleveland. O.

LGP-30 COMPUTER ABSTRACTS

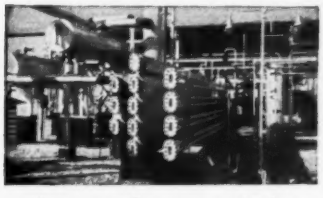
(Application Report #10, from which the following is abstracted, is free upon request from Royal McBee Corporation, Data Processing Division, Port Chester, N. Y.)

Subject: Design / User: Brown Fintube Company, Elyria, Ohio

THE PROBLEM: rush quotation for heat exchanger to potential customer. Determine best heat exchanger vs. cost combination. Perform necessary computations to obtain values for total surface area; total number of exchangers; area/exchanger; velocity and pressure drop – shell and tube; film coefficient; log mean temperature difference; overall transfer rate; clean rate; overall fouled rate; surface actually required; duty; price.

METHOD: the compact, low-cost Royal Precision LGP-30 Electronic Computer.

INPUT DATA: except for special specifications which are handled by design engineers, non-technical personnel fill in data directly from customer inquiry sheets. This information is then punched on tape.



SOLUTION: the engineer reads the above data into storage in specifically assigned memory locations on the computer's magnetic drum. The set of program instructions–also stored on the drum–then directs the computer where to find the input data and what mathematical operations to perform in the proper sequential order. The program then further directs the computer to store the various answers in specifically assigned memory locations.

Of notable interest is the incorporated test feature which allows any type and arrangement of sections to be tested by the computer. The program not only compares calculated values, but provides a corrective computation and recomputes all conditions until satisfactory values are obtained. The engineer need only type in the exact arrangement desired to have the computer calculate his proposed arrangement – assuring complete versatility and control over the program.

OUTPUT: all numbers required for the final specification sheet, including price, are provided – as well as key intermediate answers to enable the engineer to exercise judgment. The computer automatically controls the typewriter so that all answers are printed out in the desired format.

CONCLUSIONS: with the LGP-30, Brown Fintube has reduced total time on typical heat exchanger designs from one or two hours to approximately 3 minutes. Better design vs. cost combinations have been obtained – with a resulting increase in contract awards and the elimination of under-bidding. According to company officials, "perhaps the most significant contribution of the LGP-30 has been the release of engineering manpower for more basic and profound studies."

Royal Precision Corporation

Royal Precision is jointly owned by the Royal McBee and General Precision Equipment Corporations. LGP-30 sales and service are available coast-to-coast, in Canada and abroad through Royal McBee Data Processing offices. For your free copy of Application Report #10, as well as full specifications on the compact, mobile LGP-30, write today to **ROYAL McBEE CORPORATION,** data processing division, Port Chester, N.Y.

For fuses with 200,000 ampere interrupting capacity...

***plus,* extreme current-limitation**

plus,* time-lag to prevent needless blows – *you need . . .

Buss LOW-PEAK fuses

A Revolutionary New Protective Device

Buss LOW-PEAK Fuses are designed to meet modern demands for electrical protection.

They safely interrupt fault currents up to 200,000 amperes . . . limit let-thru current to exceptionally low values . . . and hold 500% load for minimum of ten seconds.

Protect Mains, Feeders, Branch Circuits, Motors, Controllers, Switches—no matter whether the fault current is 1,000 amperes, 25,000, 100,000—or as high as 200,000 amperes.

Reduce stresses and prevent damage to Panelboards, Switches, Motor Controllers—other circuit components—because let-thru fault currents are limited to exceptionally low values.

Can be easily co-ordinated into a selective system—to limit fault outages to circuit of origin.

Prevent work stoppages, lights out, waste of time and money—because long time-lag keeps them from opening needlessly on motor starting currents or other harmless overloads.

Permit increasing interrupting capacity and current limitation on present electrical system at minimum cost. Buss LOW-PEAK Fuses fit standard switches and panelboards. Available from 15 to 600 amperes in both 250 and 600 volt ranges.

Guard motors against burnout from single phasing and overloads.

Low operating temperature reduces heating in switches and panels.

Provide thermal protection for equipment against damage due to poor contact.

Protect against waste of space and money by permitting the use of proper size switches and panels.

Remain safe throughout the years without maintenance or recalibration.

▼

Write for Buss LOW-PEAK Bulletin Now . . . or use coupon.

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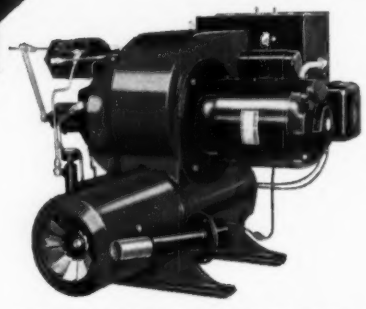
NEW HIGHLANDER

automatic boiler-burner plant

Choice of Hev-E-Oil, Hev-E-Duty gas or combination gas and oil burner

You can rely on this completely automatic unit for *all* heat or power applications. It is built for low pressure or high pressure use — burner to match for heavy oil, light oil, or combinations of gas/light or gas/heavy oil.

The new Highlander is a completely assembled boiler-burner plant (Scotch-type two-pass unit). This combination of boiler and burner brings out the best in operating efficiency and reliable performance. *Simple!* Just two flue passes. *Easy maintenance!* Boiler interior easily accessible. *Reliable!* Complete plant is carefully tested at the factory. *Guaranteed!* Each unit carries a certified rating for output. Entire unit bears Fire Underwriter's label. Write today for complete information — Dept. CE-110.



HEART OF THE HIGHLANDER is the famous Industrial Combustion Burner. Shown is the HEV-E-OIL Burner especially engineered to make use of inexpensive heavy oils. Available from 5 to 150 gph. HEV-E-DUTY POWER GAS BURNERS and combination gas/oil burners in sizes from 720,000 to 21,000,000 Btu.

INDUSTRIAL COMBUSTION INC.

EXECUTIVE OFFICES: 4507 N. OAKLAND AVE., MILWAUKEE 11, WIS.

Men in Engineering

Ferver, Dorland & Associates, Spreckels Building, San Diego, has been incorporated to engage in the practice of structual engineering. The principals are Freer Ferver and Robert C. Dorland.

E. Bradford Ripley has been appointed supervising mechanical engineer by Burns and Roe, Inc., New York City consulting engineers and constructors. He will coordinate mechanical design of power plants and other projects. Ripley comes to B&R after 34 years with a power company.

RIPLEY

COLVIN

James R. Colvin has joined the staff of Meissner Engineers, Inc., Chicago, as chief process engineer. Colvin will be in charge of process engineering for Meissner's clients in the chemical and related industrial fields.

Mockridge Associates, a consulting engineering firm specializing in solids-liquid separation, has been formed by Oscar A. Mockridge, Jr. A registered professional engineer in New Jersey and Missouri, Mockridge has had over 20 years of experience in liquid filtrations, both pressure and vacuum. Address of the firm is 460 Bloomfield Avenue, Montclair, New Jersey.

A new firm, Kruse, Flaherty & Associates, has been formed for the practice of consulting engineering. Principals are H. E. Kruse, formerly with McConathy, Hoffman & Associates, and E. J. Flaherty, formerly with Tenney Engineering and McConathy, Hoffman & Associates. The new firm, engaged in the engineering and design of commercial buildings, industrial plants, and environmental and other specialized test facilities, is located at 665 Newark Avenue, Jersey City, New Jersey.

Frank C. Riecks has joined Lester B. Knight & Associates, Inc., consulting engineers, Chicago, as senior associate. He will head up a new Detroit office located at 20111 James Couzens Highway. Prior to joining the Knight organization, Riecks was design engineer with the Timken Detroit Axle Company and held a number of engineering positions with the Ford Motor Company.

Henningson, Durham & Richardson, Inc., engineering and architectural consultants, with offices in Omaha, Colorado Springs, and Phoenix, has opened a Dallas office in the Vaughn Building. Robert E. Hogan has been named manager of the new office. Previously, Hogan headed his own engineering firm and did the design work for several residential subdivisions.

HOGAN

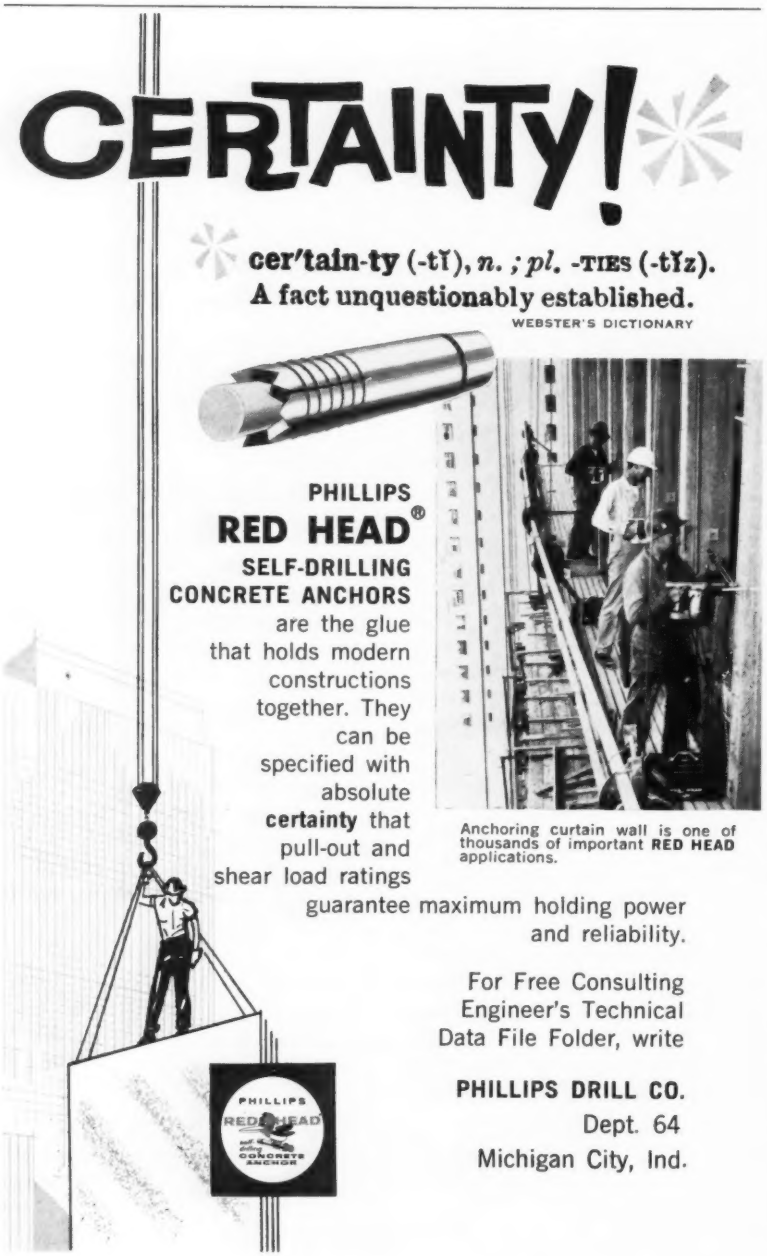
UMBENHAUER

Milton S. Umbenhauer has joined The Ralph M. Parsons Company, engineers-constructors, of Los Angeles, as manager of their recently formed power division. He is responsible for power plant engineering and business development for Parsons in the utility industry. Umbenhauer formerly was with Fluor Corporation as manager of power engineering, and with Burns and Roe, Inc., as that firm's chief mechanical engineer.

John Adaska has been named vice president of Estimators Ltd., Inc., professional construction estimators

and cost engineers, of Long Beach, California. Adaska is in direct charge of the mechanical department of the firm, which includes not only the costing of mechanical construction projects but also mechanical design and engineering of the projects.

William C. Brown, partner in Blomquist & Brown, consulting engineers of Salt Lake City, Utah, has been elected president of the Inter-mountain Institute of Consulting Engineers. He succeeds Arnold W. Coon, partner in Coon & King Engineers. Other officers include: vice president, Warren C. Curtis, resident partner, Dames & Moore and secretary-treasurer, Charles V. King, partner, Coon & King. George W. Poulsen, Jr. and Art B. Maxwell were re-elected as director and alternate director, respectively, to Consulting Engineers Council.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cer'tain-ty (-tĭ), n. ; pl. -TIES (-tĭz).
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RED HEAD
CONCRETE ANCHOR

Harvey O. Banks, Director of Water Resources, State of California, has resigned effective January 2, 1961. He has announced that he will enter private practice as a consulting engineer. Banks, who will be succeeded by W. E. Warne, Director of Agriculture, has been in the limelight recently in connection with the controversial $1,750,000,000 Feather River water project to supply additional water to Southern California.

Hugh G. Conley and Robert Prior have formed a partnership for the practice of structural engineering under the name of Conley Engineering Company, with offices at 1736 Westwood Boulevard, Los Angeles, California.

Albert A. Erkel and Associates are now located at 3330 Barham Boulevard, Los Angeles, California.

Migdal & Layne, consulting engineers, Oak Park, Michigan, has moved its offices to new and larger quarters located at 10150 West Nine Mile Road.

L. William Wood has been promoted to vice president in charge of the survey division of Johannessen & Girard, Consulting Engineers, Inc., Phoenix, Arizona.

E. O. Larson, formerly director of Region IV, U.S. Bureau of Reclamation, has been named a vice president of Berger Associates, Inc., Salt Lake City, Utah. In his new position, Larson will act on development plans for irrigation groups, on municipal and industrial water supplies, and on water rights questions.

McClelland Engineers, soil and foundation consultants, announces the completion of its new office and laboratory building at 6100 Hillcroft, Houston, Texas.

At the recent annual meeting of the Instrument Society of America,

Allied forms new

Heating, Airconditioning, & Piping Division to serve specifiers, installers, & users of Flexible Pipe Connectors

Offers complete Allflex service for controlling pipeline motion in heating, cooling, & plumbing systems

Immediate, experienced, on-the-spot service in solving pipeline problems caused by vibration, thermal expansion, and misalignment is now offered by Allied Metal Hose Company's new "H.A.P." Division, the latest specialized unit created under the firm's continuing expansion program.

The new division will serve Mechanical Engineers and Contractors thru a nationwide network of factory trained pipe-motion-engineering sales specialists, according to an announcement by Fredric R. Cahn, the company's Director of Sales.

Backed by ALLIED's extensive engineering and custom-fabrication facilities—these specialists are now at the disposal of heating, cooling, and plumbing engineers, contractors, distributors and jobbers who design, specify, furnish or install piping for pumps, compressors, turbines, condensers, cooling towers, radiators, or other fluid or air handling machinery in commercial and industrial building.

Typical H.A.P. Flexible Pipe Connectors include:

A) H.A.P. FLEXible PIPE-to-pump Connectors,

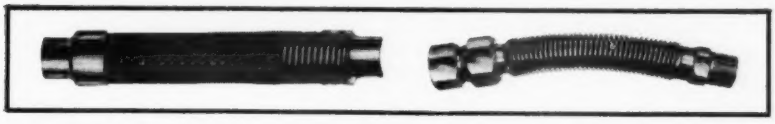
B) H.A.P. FLEXible COMPressor-to-pipe Connectors,

C) ALLFLEX VIBRATAMERS

Installed at suction and discharge ports of pumps and compressors to absorb, attenuate and isolate vibration, preventing its full transmission to the pipeline; absorb & compensate for dimensional changes caused by temperature induced pipeline contraction & expansion; and to take up slight pipeline misalignment. H.A.P. connectors minimize unbalance and excessive wear, insuring longer pump and compressor service life, and reducing maintenance time and cost.

These connectors consist of a corrugated and braided flexible tube, with Threaded, Flanged, Tube or Pipe ends. Furnished in all standard sizes—thru 16 in. in Stainless Steel, 8 in. in Bronze & Hot-dip-galvanized Steel, and 4 in. in Monel (an ALLIED "first").

D) H.A.P. Expansion Compensators—Absorb and take up pipeline expansion at right angles to the direction of movement. Designed to meet specified working conditions, these expansion compensators come in a wide variety of constructions (including unbraided for low pressures).



For complete information, experienced assistance, and the name of the Allied HAP Division Representative in your area, Write, Wire or Phone

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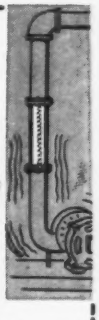

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E. Albert Adler, chief instrumentation engineer, United Engineers & Constructors, Inc., Philadelphia, was elected vice president, Standards & Practices Department.

George C. Love has been transferred from the Houston offices of H. E. Bovay, Jr., consulting engineers, to the firm's Richland, Washington, office, replacing Robert O. Grimes as chief engineer. Grimes has assumed his former position as associate of the Bovay Houston organization and has resumed his duties as senior project engineer. He also will serve as assistant projects manager to Charles A. Lawler, partner.

New address of Wight and Company, consulting engineers, Downers Grove, Ill., is 814 Ogden Ave.

H. Everett Drugge has joined the staff of Harstad Associates, engineers, architects, and planners, Seattle, Washington. Drugge, a structural engineer, formerly was with Hardesty and Hanover, New York, New York.

Martin A. Haber has joined the firm of Raymond J. Rice, engineers, New York, New York, as an associate. For the past nine years, Haber has been employed at Voorhees Walker Smith Smith & Haines.

Edwin Bock has joined Green Associates, consulting engineers, Baltimore, as the firm's chief mechanical engineer.

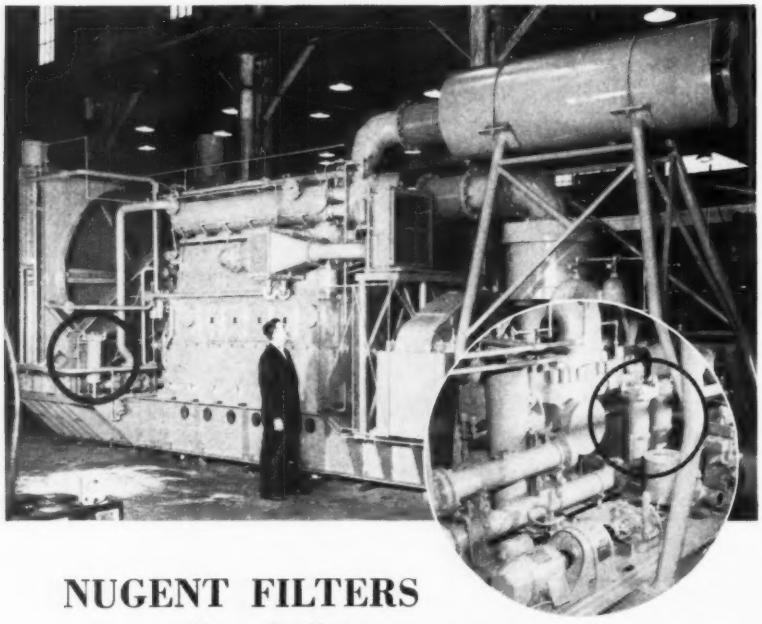
New address of Welton Becket and Associates is 10000 Santa Monica Boulevard, Los Angeles, California.

Albert H. Foster has joined Ebasco Services, Incorporated, as a general management consultant. Before joining Ebasco, Foster was a vice president of Lester B. Knight & Associates, Inc. In his long career in the consulting field, Foster has planned and directed many assignments in South America, Europe, and the Caribbean area as well as in the United States and other parts of North America.

FOSTER

BOWDEN

E. Warren Bowden has been elected president of Walter Kidde Engineers Southwest, Inc., Houston, Texas, a subsidiary of Walter Kidde Constructors, Inc., engineers and builders of New York and Houston. Bowden, also executive vice president and a director of Walter Kidde Constructors, is returning to Houston where he first established the firm's operations in the Southwest, 12 years ago. ▲▲



NUGENT FILTERS
serve diesel-driven pump in Sheikdom of Kuwait

Nugent lube and fuel oil filters provide maximum filtering protection for this skid-mounted pump package. One Nugent 1555-4S laminated fiber disc filter handles the lube oil for the 1000 HP Enterprise Diesel Engine powering the crude oil pump. Two 1555-4S units operating in parallel filter the heavy crude fuel oil consumed by the engine. The equipment is now in service in the Sheikdom of Kuwait on the Persian Gulf.

For safe, effective filtering protection . . . anywhere in the world . . . specify Nugent Filters. Wide range of types and sizes available. Write for literature.

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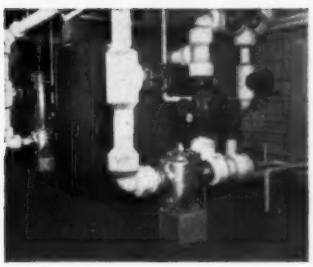

High Capacity **BRUNER** Equipment Supplies Soft Water for Baylor University Medical Center, Dallas, Texas

Soft water used in laundry and dietary facilities for Baylor Medical Center's three hospitals improves the appearance of uniforms and linen, makes dishes shine, cuts soap consumption by approximately 50%. Here, and across the U. S. leading engineers specify Bruner water softeners, America's most complete line. Full information is available from Bruner Sales Offices in all major cities.

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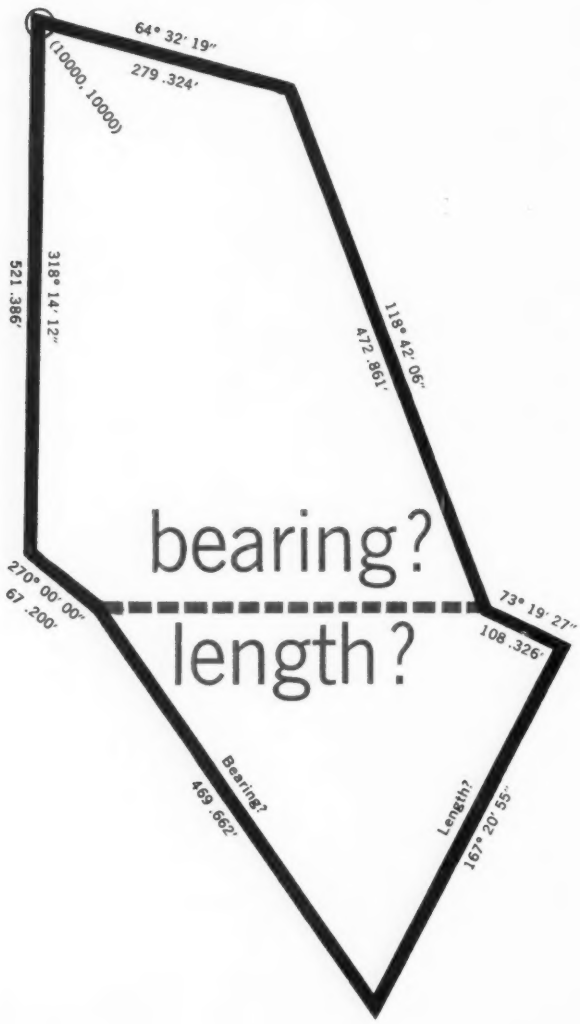

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The low-cost IBM 1620 Engineering Computer solves the traverse problem automatically, in seconds. It also balances the traverse if misclosure is within tolerance. It computes the area within the closed traverse. Versatile and fast, the 1620 can solve interdependent traverse and triangulation problems and many others not directly associated with surveys.

The time saved by the low-cost 1620 in computations like these enables your engineers to spend more time utilizing the results of surveys and less time reducing raw data to usable form.

A readily adaptable survey analysis program has been developed by IBM and will be available without cost later this year. This is another example of Balanced Data Processing, machines supported by a complete range of services. Ask your IBM representative about the advantages of the 1620 and how they can be put to use in your operation. Like all IBM Data Processing equipment, the 1620 may be purchased or leased.

The IBM 1620 is a low-cost, desk-size engineering computer with features previously found only in larger systems. It offers solid state design, magnetic core storage and high-speed internal computing performance. Its versatility and ease of operation recommend it for such engineering applications as highway cut-and-fill calculation, bridge design analysis, earthwork design and many others.

BALANCED DATA PROCESSING

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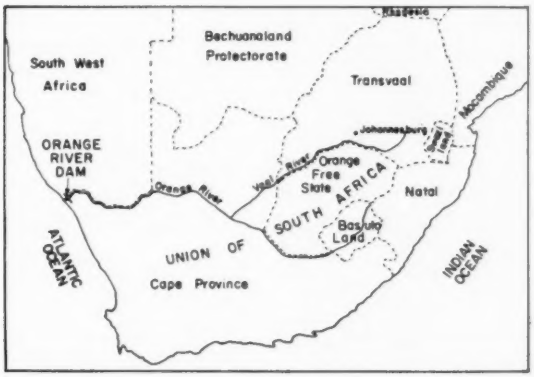
The New Projects

Africa's Orange River Dam

Sir Alexander Gibb and Partners, the well known British firm of consulting engineers, has prepared a preliminary report in connection with a vast hydroelectric project on the Orange River, 80 miles from its mouth on the Atlantic Coast of South Africa. A wall height of approximately 500-550 feet has been suggested. A reservoir of about 120 miles in length would be created behind the dam wall, with a total capacity estimated at 22 million acre feet. Based on a cupola arch dam design, 550-ft high and a power house capacity of 420 megawatts, the total capital cost has been estimated at $140 million.



Orange River Dam is proposed for location about 80 miles from the river's mouth on the Atlantic Coast.

In their report, the consultants have stated that the construction of the dam, in which some 400,000 tons of cement would be used, would warrant the construction of a cement factory capable of later serving all of South West Africa as well as Namaqualand. At the moment cement for these two vast dry regions has to be obtained from the far off industrialized areas of the Union of South Africa.

The area in which the proposed dam site is situated is extremely dry. No rains of any consequence have fallen in South West Africa in the past three years. Below the confluence of the Orange River and the Vaal River, the tributory rivers do not compensate for loss by evaporation in spite of the large areas they drain. The Orange River itself can be forded in winter (March to August) some 30 miles from the river mouth.

New Air Purifier

A new type of air purifier has been in use for over six months in the modern quarters of Robson & Woese, consulting engineers. Introduced by the Carrier Air Conditioning Company, the purifier intercepts air from heating or cooling ducts and sends it through a thick aluminum filter, where particles are trapped and washed away by a special fluid called Carrex. As the liquid is recirculated, a portion runs through a regenerator where odors are cooked out and vented outside.

At Robson and Woese, production manager Robert Miller states that the elimination of static electricity is helpful in an office where blueprints and drawings are handled. The purifiers add moisture when indoor air is excessively dry, with a humidistat metering water into the Carrex as needed to maintain desired humidity. In the Robson and Woese application a window-mounted humidistat permits maximum winter humidity without window condensation.

Replanning Paris' Railroad Terminals

The biggest and most ambitious project Paris has known since the days of Baron Haussmann will combine the passenger and freight railroad terminals on the famous Left Bank in Montparnasse. The project is a joint effort of private and public enterprise and started because the Montparnasse area is becoming blighted as the center of population of Paris moves westward. One of the main aims of the new development is restore to Montparnasse some, if not all, of its old vitality.

On the 20-acre polygonal site freed by the demolition of the old Gare Montparnasse and its maze of tracks, a new railroad depot will be built as the lower floors of a series of tall blocks. The street

A "new technical way" has been found for revolutionizing the standard powered exhaust ventilator into a new dual-purpose unit that fully completes industrial winter heating systems.

RECIRCULATES IN WINTER

Recovers heat trapped under the roof line and returns it to the floor area

Fuel costs and initial heating equipment costs can be reduced as much as 50%

EXHAUSTS IN SUMMER

Simply position a selective control switch to exhaust air from within the building

SIZES in this model range from 3,000 to 23,000 CFM

FREE ENGINEERING ASSISTANCE AVAILABLE.

NATIONAL REPRESENTATION is now being chosen

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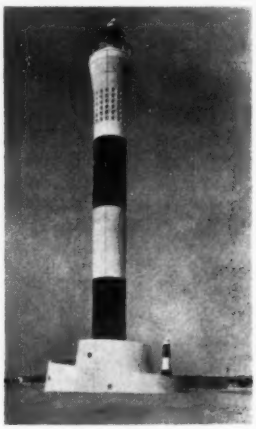
system will be improved, parking space will be provided for some 6000 autos, a 1000-room hotel will be built, as well as offices, an airways terminal, apartment buildings, and congress halls.

The central feature of the new area will be a 50-story block which will be 600-ft high. It has been described by the architects as an opportunity for the present generation to inscribe the architecture of today on a district where there is not a single stone which deserves preservation. The lower floors of this tower will form a platform 984-ft long and 328-ft wide to form the new railroad station. Architects for the project are Beaudoin, Cassan, Lopez, de Narien and Saubot.

Dungeness Lighthouse

The residents of Kent, England, are getting a look at a brand new kind of lighthouse, notable especially for the slenderness of its 130-ft tower. It was designed by the British consulting firm of Roger Ward and Partners, and is the result of months of research and testing.



Dungeness Lighthouse is a slender, 130-ft tower near Kent, England. Its signals are designed for fully automatic operation.

The base of the lighthouse is formed of a spiral ramp, enclosing the machine room, which contains all the controls, the standby generators, and the fog signal equipment. The tower, 12-ft in diameter with 6-in. walls, is made of prestressed concrete. It was built up of a series of 21, 5-ft high concrete rings laid on top of one another, with high tension prestressing wires running through the tower to provide structural strength against the local winds, which often reach 80 mph force.

The colored bands around the tower are permanent. The rings forming it are poured black and white cement. The apertures near the top are for the 60 loudspeaker units forming the fog signal. The lamp, which is little larger than a domestic light bulb, gives out over 600,000 candlepower. The

On each side of the scoreboard are mounted a matching battery of cellular horns and woofers in enclosures. A simple switch changes their use from high-fidelity music reproduction to voice projection. Linked also to an intercommunications system, this unique installation meets the exact requirements of the new Navy-Marine Corps Memorial Stadium at Annapolis. Consulting Engineers: L. P. Kooken Company, New Oxford, Pa. Installation by H. L. Berman Company of Baltimore.

UNIQUE SOUND SYSTEM SCORES BIG AT ANNAPOLIS STADIUM -delivers 900 watts of audio power from a single location!

This very specialized installation was custom-engineered without design headaches thanks to the flexibility and versatility of Stromberg-Carlson matched components. With the exceptionally wide choice of Stromberg-Carlson equipment the designers could meet every special requirement of the Navy-Marine Corps Memorial Stadium at Annapolis.

- **Single-source sound** for better distribution, easier installation. No costly cable runs, no speaker posts, no maintenance problems.
- **High-fidelity sound** from the cluster placement at one end of the playing field of matched combination of cellular horns and woofers in genuine high-fidelity enclosures.
- **Noise penetrating voice projection** achieved at central control panel by switch that attenuates low frequencies.
- **Full 900 watts of clean audio power.**
- **Telephone communications** from the side lines.
- **Microphone and telephone outlets** along the side line.
- **System can be expanded** as 29,000-seat stadium is growing to 120,000 seats—thanks to Stromberg-Carlson *matched* components.

Stromberg-Carlson is the *only* audio manufacturer who can offer a complete, versatile line of components – from telephone and loud-speaking intercom systems to stereo high-fidelity auditorium and stadium equipment.

For detailed information on how you can offer your clients significant savings in design time, installation and cost with Stromberg-Carlson "Custom-Engineered" Communication Systems, call your local Stromberg-Carlson Communications Consultant. For his name, call Western Union Operator 25, or write:

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The very finest accommodations. 60 air-conditioned rooms with TV, telephone, combination tile baths. Excellent dining room. Facilities for group parties 15 to 500.

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entire structure is capable of completely automatic operation, including an automatic fog detector.

Graduate School for Brooklyn Polytechnic

Ground has been broken on Long Island for the new Graduate Center of Polytechnic Institute of Brooklyn, at the former site of Republic Aviation's Farmingdale section. The new facilities are being completed at an approximate cost of $1½ million.

Mechanical engineering on the project was done by Sears and Kopf, of New York; the structural engineering was handled by Eipel Engineering, also of New York. The new Graduate Center will be open for classes in the fall semester of 1961.

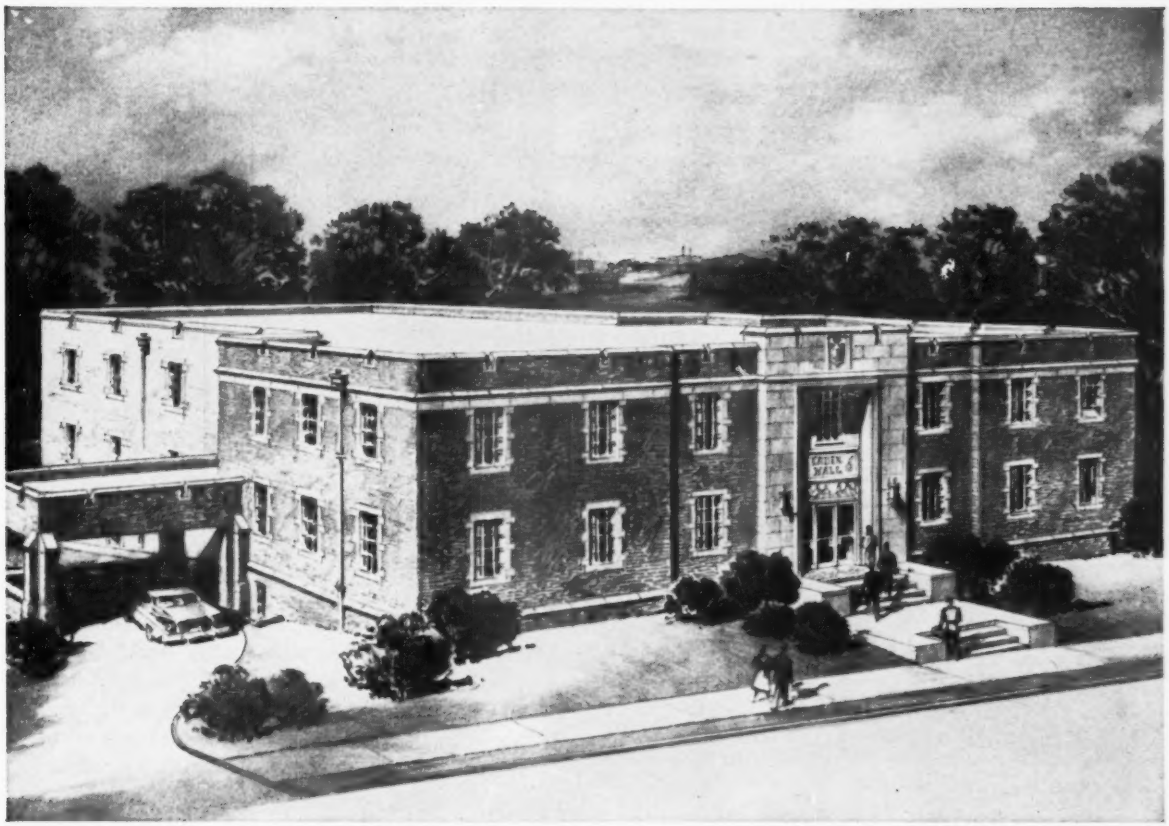
Imaginative Use of Building Materials

Imaginative use of building materials played an important role in architectural design of the one-story plant and offices of Split Ballbearing, in Lebanon, New Hampshire. Located on a 15-acre site in a scenic valley, the structure presents a colorful exterior combining ceramic glaze velour textured face brick with glass block, plate glass, and anodized aluminum.

Black ceramic glaze facing brick bonded with white mortar gives this New Hampshire plant distinction.

The black ceramic glaze facing brick, bonded with white mortar, accounts for much of the building's distinctive appearance. The standard size Natco textured brick provides an eye-catching background for a white concrete canopy covering the front walk and entrances to the plant and offices. The canopy, which was cast in place, is supported by 14 steel columns that are painted a brilliant red.

Architectural firm was Carl M. Koelb & Associates, Weston, Massachusetts, and the consulting engineer was Anderson-Nichols Company, Con-



MARLO *Quietly* LEADS THE CLASS IN ENGINEERS' AIR CONDITIONING TEST

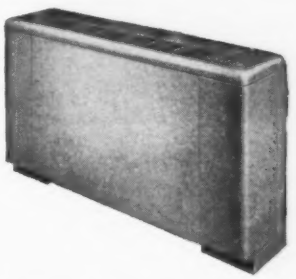
Selected over nine other makes to comfort condition new music conservatory

There was no guesswork in the selection of air conditioning for the new Cadek Hall, conservatory of music at the University of Chattanooga, designed by architects Shepherd and Smith.

The consulting engineers, Campbell & Jones, conducted comparison tests on 10 leading makes of equipment. Judgment was on the basis of noise level, overall construction, and individual features such as access panels, grilles, etc.

Results of the tests pointed conclusively to Marlo Seazonaire remote room units as the best choice. Low noise level in particular was an outstanding characteristic of the Marlo equipment, which operated as quietly at high speeds as other units at low speeds.

For **your** air conditioning needs, you'll find this same high quality typical of the entire Marlo line. The Marlo representative in your area can give you complete information.



Marlo Seazonaire Unit, Model FWC-C, selected for Cadek Hall, University of Chattanooga.

MARLO coil co.

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Quality Air Conditioning and Heat Transfer Equipment Since 1925

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cord, New Hampshire. The general contractor was R. E. Beam Construction Company, Concord, N. H.

New International Bridge

The Montreal consulting firm of H. H. L. Pratley has been retained by the St. Lawrence Seaway Authority to design and supervise the construction of the North Channel span of the Cornwall-Massena International Bridge. The North span, some 1¼ miles long, with the already-completed South span and a new road across Cornwall Island, will provide the only public crossing of the seaway for about 80 miles along the river.

New Iranian Oil Outlet

The government of Iran this summer opened for use a new oil tanker jetty at Kharg Island in the Persian Gulf. The 2000-ft pier, with one of the world's largest potential capacities, was designed for Iran by Frederick R. Harris, Inc.

The pier is an all-welded steel structure on steel piles, with an energy-absorbing fender system that permits berthing tankers in almost any weather. The jetty, in 60 feet of water, is connected to shore by a half-mile steel trestle and a quarter-mile causeway, forming part of the harbor break-wall.

Crude oil is piped to the island jetty through a 100-mile line from the Gach Saran oil fields. The pipeline – one-fourth of it under water – is expected to greatly increase the importance of the Gach Saran region, which has long been hampered by lack of a suitable outlet to the world market. The line presently is capable of delivering 350,000 barrels of crude oil a day by gravity flow; the exact output depends upon completion of berthing facilities at Kharg. Two berths are in use now; two more are almost ready.

New oil tanker jetty at Kharg Island in the Persian Gulf has potential for the world's largest capacity.

Topping Out the Travelers Building

Los Angeles' newest and tallest office building, the 22-story Travelers Insurance Company building, neared completion late this year as the last piece of structural steel, a 22-ft beam, was hoisted into place. Before it was raised, the beam was signed by Mayor Norris Poulson of Los Angeles; representatives of the owner, the contractor, and the financier; and Welton Becket, whose Los Angeles firm did all the architectural and engineering work on the project. Scheduled to be opened by the end of next year, the building will cost in the neighborhood of $14 million.

Another California Freeway

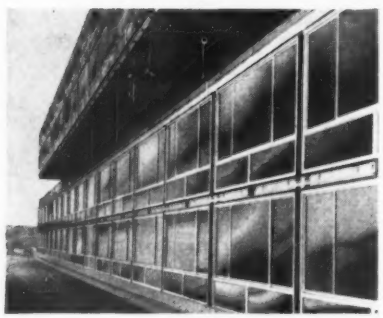
The State of California has claimed another first; a "pedestrian freeway," installed in San Diego's Balboa Park Zoo. The 2-section, 312-ft Speedramp, built by Stephens-Adamson, of Aurora, Illinois, carries visitors to the top of a 64-ft hill in the middle of the zoo. The Speedramp's rubber belt operates without benefit of protective cover.

GE Plant Opens in Indiana

The General Electric Company has started operations in their new Mount Vernon, Indiana, plant for production of polycarbonate resins. It is the first self-contained plant in the country for the manu-

HORNFLEX

Sealant...



for all the wide open beauty of curtain wall design...

with none of the weather sealing problems

Hornflex Sealant compresses, stretches and flexes with wall movement—yet keeps a solid weather seal at all temperatures. Bonds lastingly to aluminum, glass, steel, concrete and stone to form a watertight seam that stays put.

Hornflex Sealant also has many uses in swimming pool, highway and bridge construction. Write for 8-page catalog, Dept. CE-144.

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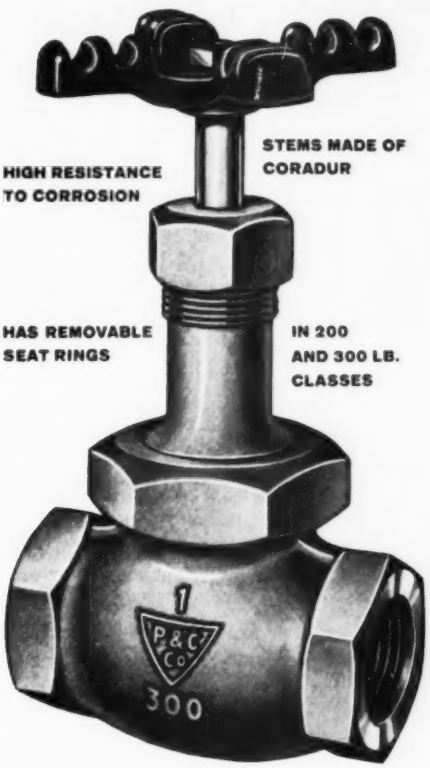
Sales offices and warehouses throughout the United States and Canada

"R-P&C Bronze Valves keep performing like new"



"Valves, like any vital piece of plant equipment, must be kept in top working order at all times. And with R-P&C Bronze Gate and Globe Valves this is no problem, for these valves have **renewable seat rings.** Made of durable 500 Brinell Stainless Steel, or Copper Nickel, seat rings can be screwed in or out if replacement is necessary. Moreover, when servicing is required, the union bonnet permits fast, easy access to internal parts."

The **stems** of R-P&C Bronze Valves are made of special Aluminum Silicon Bronze (**CORADUR**) to afford high resistance to corrosion and seizure. Their **full plug** design makes them ideally suited for throttling in steam, water, oil and/or gas service. Air-cooled, **cross-type handle** gives added ease of operation.

These features, and many others, are available with R-P&C Bronze Gate and Globe Valves in the 200 and 300 pound classes.

Contact your R-P&C distributor for complete information about these valves as well as R-P&C's complete line of electric furnace iron, cast steel, bar stock and forged steel valves.

R-P&C VALVES

ACCO

R-P&C Valve Division, American Chain & Cable Company, Inc.

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facture of these transparent thermoplastic materials, particularly noted for their impact resistance and dimensional stability.

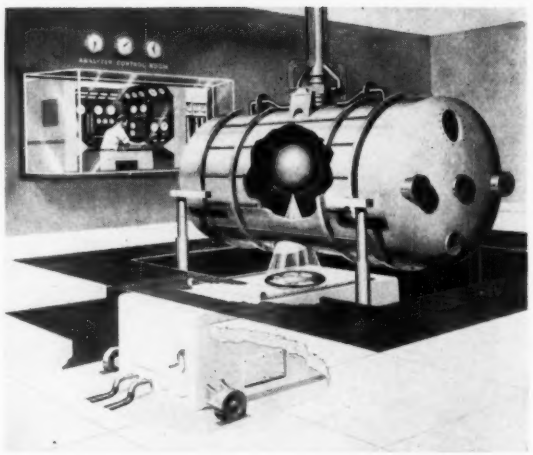
Detailed design and engineering for the plant was done by the firm of Crawford and Russell, Inc., of Stamford, Connecticut. Crawford and Russel specializes in the design and construction of polymer plants, and has done extensive work with GE.

Air Force Dynamic Analyzer

Burns and Roe, Inc., New York City engineers and constructors, have been retained by the Minneapolis-Honeywell Regulator Company to design and install support facilities for a dynamic analyzer at Wright-Patterson AFB, in Dayton, Ohio. The analyzer, designed for an advanced reconnaissance system, will simulate flight conditions from sea level to orbital altitudes. It will permit laboratory study of reconnaissance equipment as affected by buffeting, vibration, pitch, yaw, and roll.

Installation of the equipment, in an existing building, includes the dynamic analyzer capsule which will house carefully prepared test specimens. The capsule is being designed and fabricated by the Cook Electric Company.

A vibration study by Burns and Roe is currently under way to determine the effects of the various motions on the capsule and target cart foundation.



Support facilities for a dynamic analyzer at Wright-Patterson AFB, Dayton, Ohio, designed by Burns and Roe.

The target cart itself will be acoustically shielded to isolate sound wave transmission so that the sensitive mechanism will not be damaged.

Nyasaland Hydroelectric Scheme

In 1951, the Nyasaland government commissioned Sir William Halcrow and Partners, British consulting firm, to make a Shire Valley survey. This entailed a study of the Shire River, the lake level of Lake Nyasa, power transport on the lake, communications, navigation, and land reclamation. Hydroelectric power stations on the river were proposed in the report which followed the survey. But the plans were beyond Nyasaland's resources at that time.

Now the Minister of Economic Affairs, J. M. Caldicott, told the Federal Assembly recently that the government will vote £100,000 on preliminary preparations for a Nkula Falls scheme – mainly working drawings and contract documents. This scheme will cost only £3 million, which the government believes can be raised without difficulty. The Nkula Falls are on the Shire River, 22 miles northwest of Blantyre, and consist of rapids falling 170 feet in a horseshoe bend. Under the scheme, the bend will be cut off by a tunnel, at the bottom of which the power station will be built. Ultimately it is hoped that the area will develop a total supply of 134 megawatts.

Korean Power Plant

The New York City engineer-constructor firm of Burns and Roe is conducting an extensive survey of the Kunsan, Korea, area, to locate a site for a new 30,000-kw power plant for southwestern Korea.

Southwestern Korea presently has no major generating facilities of its own, and relies for power

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Sewage Pump Well Elevation Held at 114.5′±3″ Despite Big Variations in Flow

Three of four E-M 200 hp, 1200 rpm Vertical Synchronous Motors with Adjustable-Speed Magnetic Drives at Nut Island Sewage Treatment Plant of the South Metropolitan Sewage System in Quincy, Massachusetts.

E-M Vertical Synchronous Motor and Magnetic Drive Unit for adjustable-speed power transmission to vertical centrifugal pump. The ring element (1) mounted directly on the motor shaft turns at motor speed. The magnet element (2), mounted inside the ring element, has no mechanical connection to the motor . . . torque is transmitted through magnetic flux linkage between ring and magnet. By varying amount of excitation to magnet, pump speed can be precisely controlled.

AMAZINGLY PRECISE CONTROL OF SEWAGE PUMPS OBTAINED WITH E-M ADJUSTABLE-SPEED MAGNETIC DRIVES

One of the critical problems in operating Boston's new Nut Island Sewage Treatment Plant is complete control over the wide daily, weekly or seasonal flow variations. For example, flows may vary from 63 mgd to 249 mgd, with peak loads of nearly 300 mgd during stormy periods.

The pump well has to maintain an elevation of 114.5 feet with not more than 3 inches variation, to assure proper levels and flow velocities in the sewage processing channels. Control of the output of the low-lift sewage pumps has to be fast and remarkably accurate.

Use of E-M Adjustable-Speed Magnetic Drives for the low-lift pumps provides the sensitive speed control necessary in maintaining this close command of the pump well elevation.

Pump speed changes are dictated by a well float that actuates the Magnetic Drive through an E-M "Regutron" Control. Pump speed is automatically increased or decreased to maintain precisely the required pump well elevation. The Magnetic Drives are highly important and effective factors in most efficient operation of the Nut Island Sewage Treatment Plant for eliminating pollution in Boston Harbor.

For more information, see your nearest E-M sales engineer. And write direct for a copy of E-M Synchronizer No. 38 which tells the complete story of this outstanding installation.

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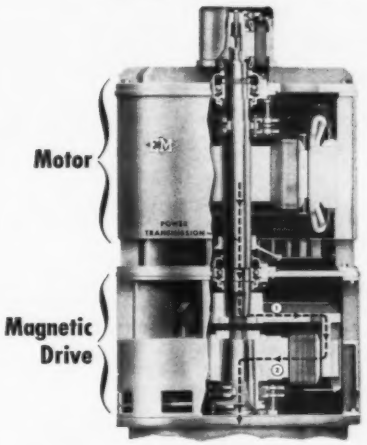

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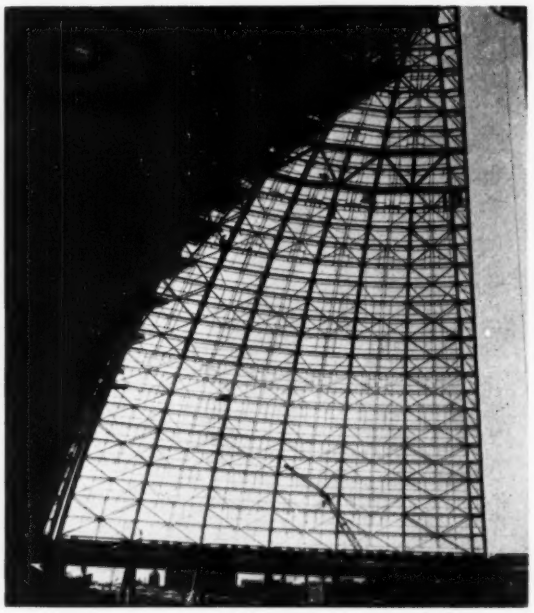
on a tie-in with a nation-wide network from other regions. This has meant system instability and frequency variations, often tripping circuit breakers and causing expensive outages. The new power plant will increase the country's total capacity by about 8 percent, and will make the Kunsan area independent of outside power. A tentative site selection has been made on the Kum River estuary near the Yellow Sea.

The site survey by Burns and Roe has included a check of water characteristics from surface level to a depth of 30 feet, as well as the normal considerations of access, soil, and fuel supply. Construction of the power plant is scheduled to begin next spring, and the plant is due to go into commercial operation late in 1962.

Pittsburgh's Big Convertible

The new public auditorium at the upper end of Pittsburgh's "Golden Triangle" will include a widely variable communication system, mainly in the center exhibition hall, where exhibitors will be able to install telephones at any point.

National Electric Wirewa, an enclosed metal raceway for housing electric lines, is being installed throughout the lower level of the auditorium, in a ceiling mounted position. Wirewa, made by the H. K. Porter Company, permits access to lines at all points in the system, for tapping, rerouting, and other servicing.



Structural steel work is well underway on the Pittsburgh Auditorium, which was designed by Amman & Whitney.

The auditorium, designed by Ammann & Whitney, of New York (see "Dome Structures," CONSULTING ENGINEER, December 1959), when completed sometime next year, will seat 14,000. Total cost will be about $20 million.

High Strength Bolts Replace Rivets

A shortage of experienced riveting gangs in the Quincy, Illinois, area – as well as elsewhere in the country – forced the substitution of high strength bolts for the original riveted design on a new bridge being built for the Chicago Burlington & Quincy Railroad. The 2500-ft long bridge will become the first major railroad crossing in the U. S. to use high strength bolting. About 140,000 bolts will be required to complete the final two-thirds of the bridge.

Howard, Needles, Tammen & Bergendoff were the consulting engineers for the CB&Q project. They agreed to allow the Bethlehem Steel Company to use high strength bolts when it became evident that the original construction schedule could not be maintained if riveted construction was used. Although highway bridges have been designed as high strength bolted structures for several years, this design for railroad bridges is relatively new, although previously used in Canada. One of the big advantages of high strength bolting is the fact that a good job can be turned out by men who have very little experience. ▲▲

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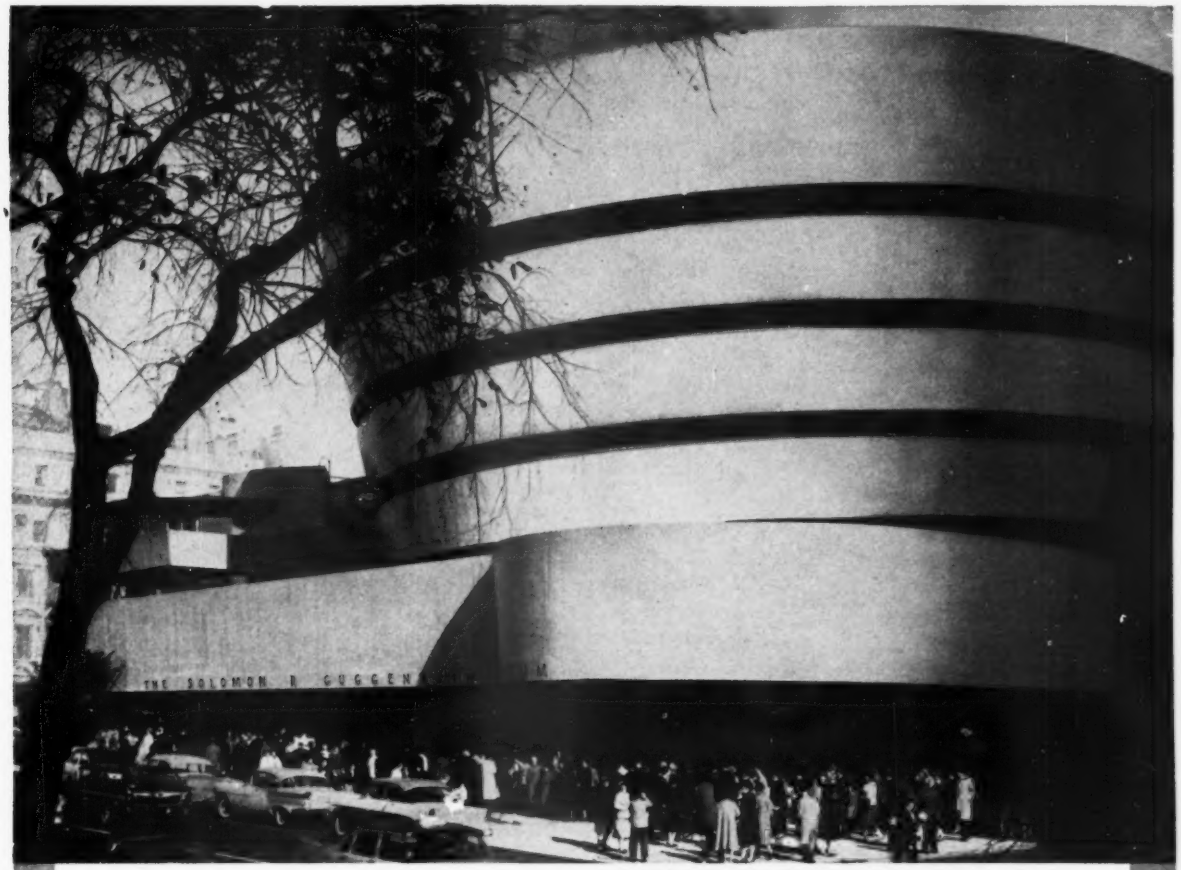

The Solomon R. Guggenheim Museum, New York, New York
Architect: Frank Lloyd Wright
General Contractor: Euclid Contracting Corp., New York, New York

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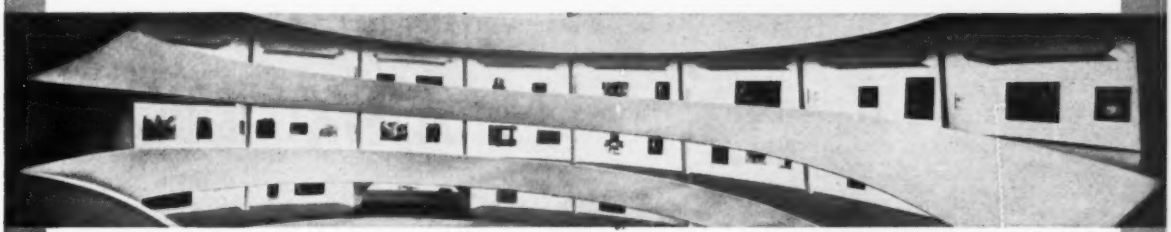

Interior view of the museum showing spiral ramp galleries.

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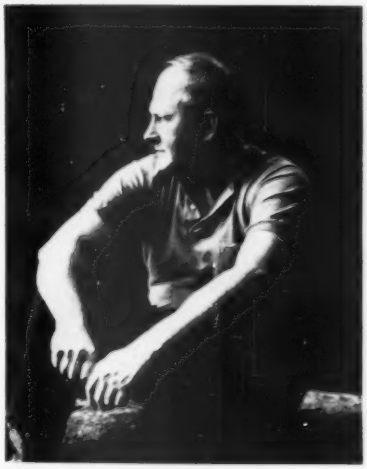
The Waste Makers, by Vance Packard; David McKay Co., Inc., New York, N. Y.; $4.50.

Vance Packard has again padded a long article and made it into a book. Serious as this criticism is, it does not detract from the importance of *The Waste Makers*. With too many automobiles for our roads, too many toilets for our overburdened sewage treatment plants, and not enough water to go around, it is probably about time that we took a good hard look at consumer production and measured its real value in terms of our crying need for more roads, more sewage treatment plants, and more water conservation measures.

It is Packard's contention that American industry now has the ability to turn out more than enough consumer goods for both our internal and any export markets we are able to crack. This, he says, has led to a last ditch stand by the marketing men who get the American public to buy for buying's sake. He cites examples of planned obsolescence, "style" changes, "new" models, and a number of other similar gambits which are designed to get the consumer in the mood to buy. Industry, in its frantic obsession with these phony ideas, has let technological advancement fall by the wayside, according to Packard.

It is unfortunate that Packard's books are the kind which most people read, agree with heartily, and then promptly forget. However, there is some indication that the American public is growing quality conscious and slowly turning against the well established custom of buying a new car every year — with the roof two inches lower and the tail fin two inches higher. According to Packard, the two U. S. political parties are in clearly opposite camps on the question of "consumerism." Republicans, he says, believe in the production of more good things for the American people. Democrats believe in the creation of a better environment for the American people. If it were as simple as that, the problem could be solved in the coming elections. This oversimplified solution is typical of Packard, but he does see, with brilliant clarity, the particular problem on which he is concentrating.



VANCE PACKARD

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Under the Deep Oceans, by T. F. Gaskell; W. W. Norton & Company, Inc., New York, N. Y.; $3.95.

The story of H. M. S. Challenger's worldwide oceanographic expedition is told in an interesting and authoritative manner by Dr. T. F. Gaskell, who was chief scientist of the expedition. According to Gaskell, the deep oceans are permanent from the earliest geological times. They have existed as oceans, not sharing in the rise and fall above the sea's surface that occurs in the shallow waters near the continents. Oceanographers can therefore make investigations into geology impossible on land.

Thus the tour of the Challenger has opened up fascinating prospects of discovery and solved a number of problems such as the origin of the coral atolls and the status of that ambiguous piece of water, the Mediterranean.

The deep oceans are exciting places. From their floors rise huge mountain ranges, and there are gulfs so deep that Mount Everest could easily be drowned in them. Across the sea-bed from time to time race sudden "turbidity currents" that score deep trenches in the level floor, like a hose left running in the garden. These and

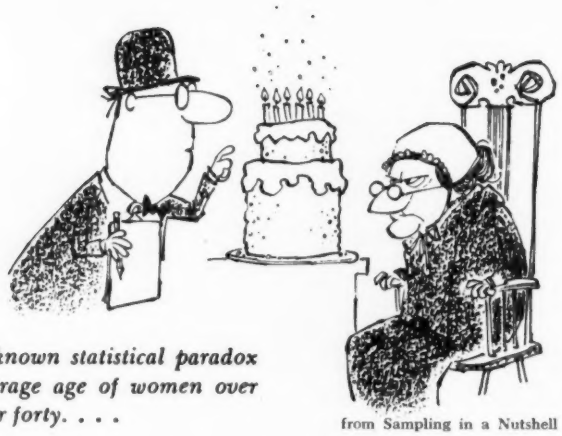
many other remarkable physical phenomena are the subject of Dr. Gaskell's book.

Sampling in a Nutshell, by Morris James Slonim; Simon and Schuster, Inc., New York, N. Y.; $3.50.

Here is a little book that is fun to read and fun to look at. At the same time it does just exactly what its title implies – puts sampling in a nutshell.

While the particular emphasis of this book is on the use of statistical sampling as a practical tool for the businessman, it can also be put to good use by the consulting engineer. In fact, it is the engineer engaged in management consulting who has made the greatest use of this new mathematical tool.

Whether it is a matter of immediate concern, or merely of keeping abreast with new techniques, the consulting engineer will find *Sampling in a Nutshell* a very interesting little volume.



It is a well-known statistical paradox that the average age of women over forty is under forty. . . .

from Sampling in a Nutshell

The Law Of International Transactions And Regulations: Cases And Materials, by Milton Katz and Kingman Brewster, Jr.; The Foundation Press, Inc.; $11.50.

This book, by two Harvard law professors, covers a subject which has many areas of interest to engineers and engineering firms engaged in international projects. Of particular interest is the coverage on the use of property within a foreign country; engaging in economic activity within a foreign country; doing business abroad as a foreign corporation or through a corporation organized under local law; international transactions with foreign governments or their instrumentalities; and overlapping or conflicting regulation and taxation, as well as nationalization, expropriation, and annulment of contracts or concessions. In other words, more than half of the book covers subjects which may be of considerable interest to engineers engaged in work outside the U. S.

However, while the subject matter of the book may be of interest to engineers, an individual engineer cannot get many answers by reading it. It is not an engineering book, but a casebook designed specially for law students. As such, it raises interesting problems, by setting forth various legal decisions and other legal materials (e.g. treaties), but it does not give any substantial textual treatment of the solutions of these problems. This is substantially the conventional casebook approach which is used in law schools, where no one ever seems to be very concerned with attempting to organize the body of knowledge into a comprehensive system, but rather is content to contemplate the problems in a speculative or philosophical vein as being "interesting" to discuss, to argue about, and to dissect. As a result, an engineer attempting to find solutions to his problems or even reasonably safe, guiding principles is

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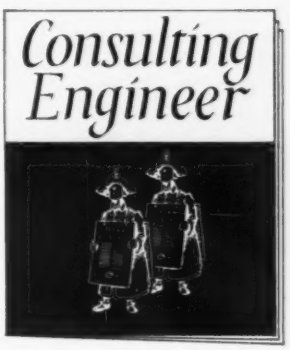

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likely to be very disappointed with this volume.

In view of the fact that the subject mater is not classified in the conventional manner (i.e. it cuts across ordinary law courses in public international law, in private international law or "conflict of laws", as well as comparative law), it is very difficult to see how this book can be used in any but the largest of the law schools, as an elective course or seminar. There simply are not enough students available in most law schools to make such an elective course or seminar practicable. This is unfortunate, since the subject matter and the materials collected in this book are of considerable interest and ought to be utilized in some practical manner. Some consideration ought to be given to using the book in connection with seminars which are not restricted to law students. Seminars open to senior and graduate students in engineering, business administration, and law might well be organized around it. If such seminars were opened in universities in large cities, and could also be attended by professional persons not matriculated in the university, it might be possible to get some very interesting and worthwhile results for all concerned.

•

New Technical Books

KINEMATICS AND DYNAMICS OF MACHINERY, by Robert L. Maxwell; Prentice-Hall, Inc., Englewood Cliffs, N. J.; $9.75. The author has attempted to present, in one volume, the bulk of principles and practical applications of machine design that the mechanical engineer is expected to know. Professor Maxwell writes like a professor; the text is not difficult, merely professorish.

ELECTRONIC PROCESSES IN SOLIDS, prepared by Roland J. Coelho and Gianni Ascarelli; John Wiley & Sons, Inc., New York, N. Y.; $14.00. This monograph is based on a series of lectures given at M. I. T. in 1957 by Pierre Aigrain. The material is an expanded and revised version of notes the authors took at those lectures. Band theory and transport theory are treated at an intermediate level, assuming the reader is familiar with calculus and wave mechanics.

THE HANDBOOK OF GEOPHYSICS, prepared by the U. S. Air Force; MacMillan Co., New York, N. Y.; $15.00. This revised version of the 1957 edition of the same book was written for the Air Force by some 60 civilian scientists, making use of the latest data available from satellite and rocket exploration, polar expeditions, and extensive meteorological observations. The book deals at length with the atmosphere and weather; to a lesser extent with electro-magnetic phenomena; acoustics and visibility; the sun, meteors, and cosmic radiation; and geology of the earth's surface. It is organized as a military manual (though fortunately it is more readable than most), and relies extensively on charts, graphs, and tables.

ENGINEERING ANALYSIS, by Wen-Hsiung Li; Prentice-Hall, Inc., Englewood Cliffs, New Jersey; $11.00. Based on a course taught by Dr. Li at The Johns Hopkins University, this book is intended as a sort of refresher course in engineering mathematics. Differential and integral calculus, vector algebra, ordinary differential equations, and the Fourier series are treated in more-or-less text book fashion, with emphasis on theory as well as application.

DIGITAL COMPUTERS AND NUCLEAR REACTOR CALCULATIONS, by Ward S. Sangren; John Wiley & Sons, Inc., New York, N. Y.; $8.50. Dr. Sangren has divided his book into two major sections: the first gives an introduction to the problems and methods of the digital computer, with a review of the essential mathematics; the second is a detailed ex-

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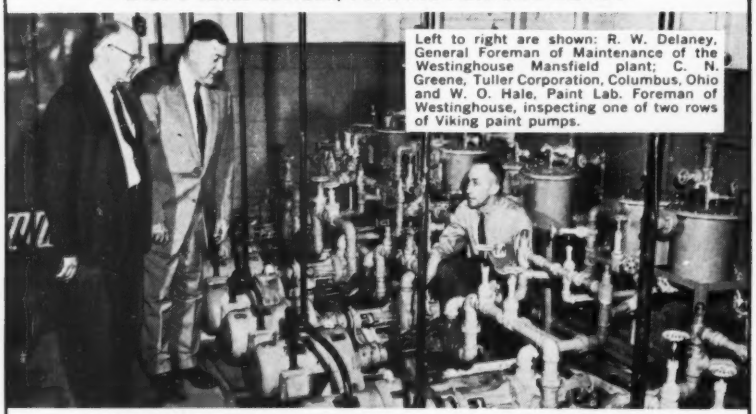

Left to right are shown: R. W. Delaney, General Foreman of Maintenance of the Westinghouse Mansfield plant; C. N. Greene, Tuller Corporation, Columbus, Ohio and W. O. Hale, Paint Lab. Foreman of Westinghouse, inspecting one of two rows of Viking paint pumps.

WESTINGHOUSE Electric Corporation's major appliance plant at Mansfield, Ohio has materially reduced the problem of pumping abrasive type coating materials, according to Mr. C. Reining, Manager, Works Engineering. **VIKING'S** new abrasive liquid **PUMPS** are the answer, working 24 hours a day, 7 days a week. These new pumps are lasting three times longer than any previous equipment and still going strong. Pressures range from 45 to 95 PSI. Of the 28 **VIKING PUMPS** handling paints, primers and finish coatings in the Westinghouse Mansfield plant, 12 are the latest type of **VIKING** abrasive liquid construction. The other 16 will be replaced with new type **VIKINGS.**

Have an abrasive liquid pumping problem at your plant? Profit by this Westinghouse experience! Install new **VIKING PUMPS,** with ceramic bearings and mechanical seals, especially designed to handle abrasive* liquids and provide long pump life. When writing please give this information: 1. Liquid pumped, 2. Viscosity of liquid (SSU), 3. Percentage and type of solids present in liquid, 4. Temperature of liquid, 5. Specific gravity, 6. Capacity of pump, 7. Suction lift or head, 8. Discharge pressure . . . and ask for bulletin SP-507P **VIKING PUMP COMPANY,** Cedar Falls, Iowa, U.S.A. In Canada, it's **"ROTO-KING" PUMPS.** (*Consult factory for recommendations on pumping abrasive liquids other than paints and inks.)

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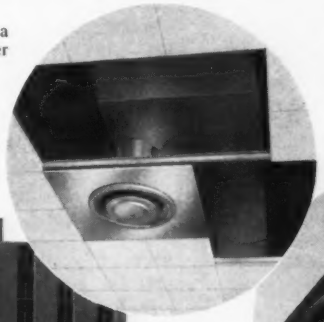
C & P Telephone Company of West Virginia Dialed "C" for CONSTANT COMFORT CONDITIONS

This exposed view shows a Kno-Draft circular diffuser tied into the ductwork.



The combination air diffuser-loudspeaker offers functional and design advantages . . . both the sound source and the diffuser occupy the same strategic ceiling location.

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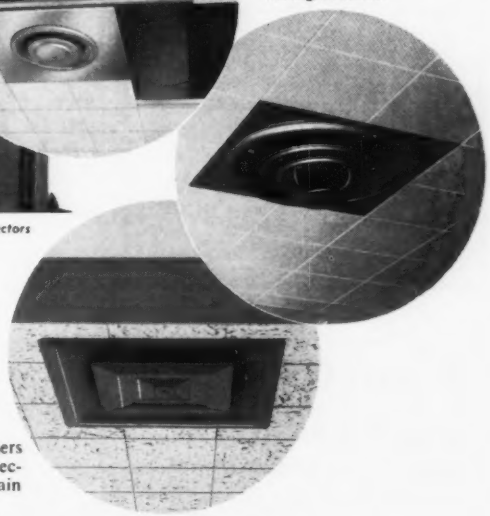

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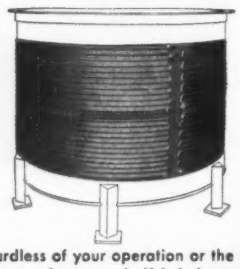

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planation of the use of the digital computer in high speed nuclear calculations. The author, as Chief of Mathematics and Computing at the John Jay Hopkins Laboratory for Pure and Applied Research, can be expected to have done a competent job. A brief glance through the book does not say as much for the printer's copy-readers.

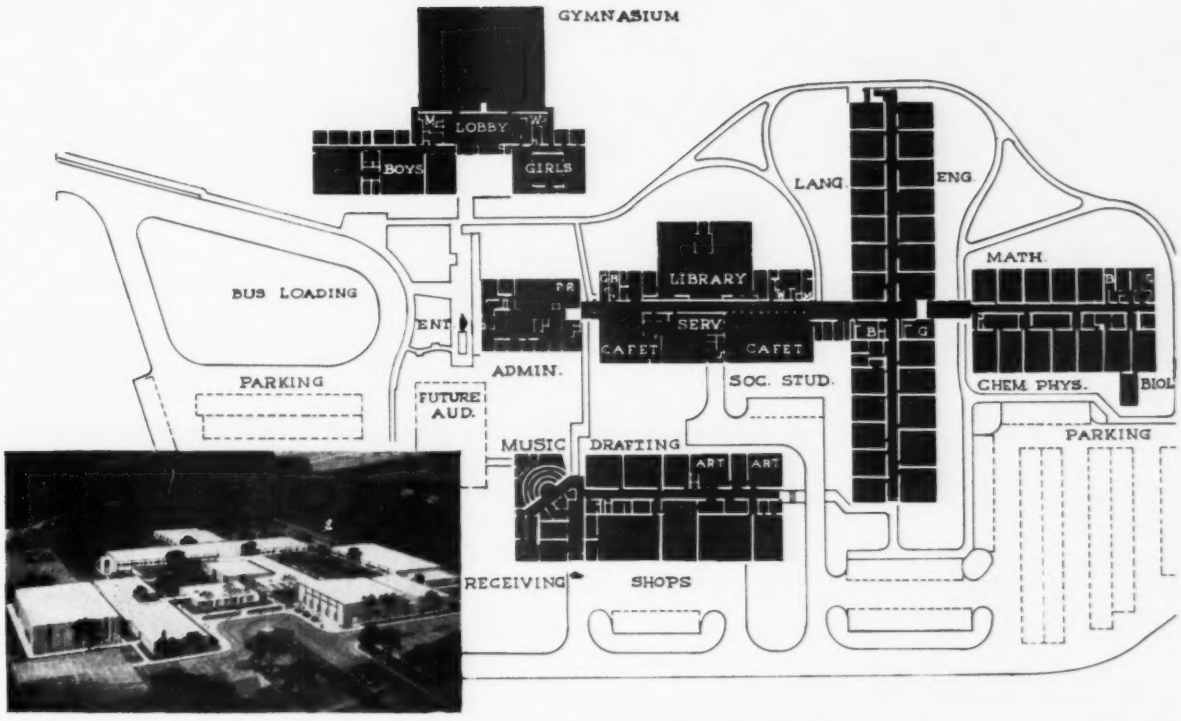
NEW METHODS OF HEATING BUILDINGS, Building Research Institute, Washington, D. C.; $5. This book is a result of the research correlation conference conducted by BRI in November 1959. It includes energy and fuels for future heating and power systems, new air heating methods, hydronic heating, radiant systems for heating, new electric heating systems, solar heating, and future heating research needs. It also contains abstracts of conference papers and a list of previously published BRI conference proceedings.

PRINCIPLES OF CHEMICAL THERMODYNAMICS, by Charles E. Reid; Reinhold Publishing Corp., New York, N. Y.; $7.80. This book is one of the Reinhold physical and inorganic chemistry textbook series. The book is distinctive in that entropy is treated postulationally, with no attempt to make it depend on heat engines. A chapter on statistical thermodynamics is included, and molecular concepts are used freely whenever they serve the purpose of clarity. The terminology is not original but has been chosen so as to be readily understandable to those accustomed to any of the more common systems.

THEORY OF INERTIAL GUIDANCE, by Connie L. McClure; Prentice-Hall, Inc., Englewood Cliffs, N. J.; $12. This book provides a clear approach to the study of inertial guidance and navigation. It combines in one volume the classical concepts of Newtonian dynamics and motion with the latest topics relating to schematic design, error analysis, and functional appraisal. Opening with a review of cartesian transformations, vector quantities, kinematic fundamentals, and rigid dynamics, it then concentrates attention on the salient features in classical gyrodynamics and the preliminary theory of stabilized platforms. The book continues with an appraisal of the vertical coplanar dynamics of the leveling and indicating mechanisms. The volume concludes with the spatial analytical description and simulation of inertial systems.

PROBABILITY: AN INTRODUCTION, by Samuel Goldberg; Prentice-Hall, Inc., Englewood Cliffs, N. J.; $7.95. This book, one of the Prentice-Hall mathematics series, deals fully with the essentials needed by all who use probability concepts, apply statistical techniques, or measure the effects of chance phenomena. Supplying basic information first, the book opens with a helpful treatment of the elementary mathematics of sets. It continues with a penetrating examination of sample spaces and probability theorems. A separate chapter is devoted to counting procedures which can be applied to a wide variety of complex experimental situations. It also discusses such topics as random variables, mean values, standard deviations, and binomial probability distributions.

MATHEMATICAL METHODS FOR DIGITAL COMPUTERS, edited by Anthony Ralston and Herbert S. Wilf; John Wiley & Sons, Inc., New York, N. Y.; $9.00. This book offers mathematical analyses and derivations of commonly used techniques of digital computation, with step-by-step discussion of the actual processing of complex mathematical and physical problems. The chapters follow a standard format – giving in order the purpose of the program, a mathematical analysis of the problem under consideration, the calculation procedures to be used, a detailed flow



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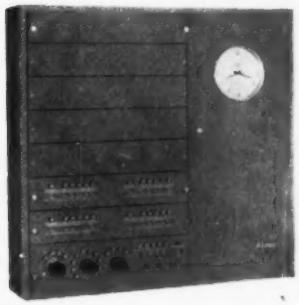

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chart, a description of the flow chart, the memory requirements, an estimate of running time, and a list of references.

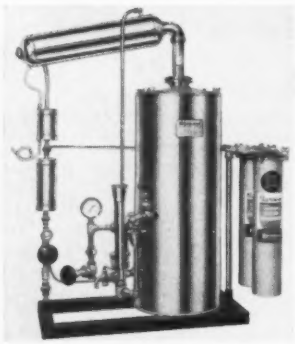
STATISTICAL THEORY OF SIGNAL DETECTION, by Carl W. Helstrom; Pergamon Press, Inc., New York, N. Y.; $9.50. This is volume 9 of the *International Series of Monographs on Electronics and Instrumentation.* This work is a mathematical approach to detection, in the presence of random noise, of electrical signals such as those used in radar and communications. It teaches the philosophy used in the design of optimum detection systems and analyzes the factors on which signal detectability basically depends. It opens with an introduction to the theories of linear filtering and random noise and goes on to describe the statistical theory of hypothesis testing. The statistical theory of estimation is described and applied to the problem of estimating signal parameters in the presence of random noise. The book is written for graduate students and for workers in mathematics, electrical engineering, or physics. It is a text rather than a reference book.

DESIGN OF STEEL STRUCTURES, by Boris Bresler and T. Y. Lin; John Wiley & Sons, Inc., New York, N. Y.; $9.75. The authors, both professors of civil engineering at the University of California, have used exerpts from design calculations of several existing bridges and buildings to illustrate their work. The book pays more attention to specific points of structural problems and design code than to complex design situations.

DICTIONARY OF AUTOMATIC CONTROL, by Robert J. Bibbero; Reinhold Publishing Corp., New York, N. Y.; $6.00. This is exactly — no more, no less — what the title implies: a dictionary of the terms used in automatic control. The author has tried to clarify the confusion that exists as a result of different applications of the same terms. A few diagrams might have aided his cause a great deal.

POLYSTYRENE, by William C. Teach and George C. Kiessling; Reinhold Publishing Corp., New York, N. Y.; $5.00. Properties, manufacture, and application of polystyrene are the core of this well-written book, with additional sections on fabricating techniques and polystyrene foam. A few more basic diagrams, to replace some of the rather unimaginative photographs, would improve the over-all appearance of the book.

WAVE GENERATION AND SHAPING, by Leonard Strauss; McGraw-Hill Co., Inc., New York, N. Y.; $12.50. Mr. Strauss has tried to treat his subject as a unified whole, rather than trying to deal individually with each of the various circuits



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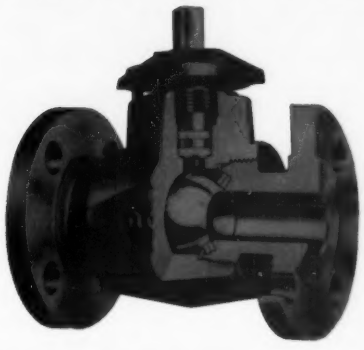

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used for wave generation and shaping. The book is divided into five major segments, covering models and shaping, timing, switching, memory, and oscillations.

FUEL CELLS, edited by George J. Young; Reihold Publishing Corp., New York, N. Y.; $5.75. Based on the findings of an American Chemical Society symposium, this book explores the present and potential applications of direct energy conversion in various types of fuel cells. The text is specific and technical, avoiding the see-it-now, do-it-yourself approach.

WASTE TREATMENT, edited by Peter C. G. Isaac; Pergamon Press, New York, N. Y.; $15.00. Papers delivered at a recent British symposium on the treatment of waste matter are presented, with edited versions of the discussion on each paper. The writers devoted their time to two aspects of waste treatment: the theory and practice of biological treatment, and the disposal of solids removed from liquid wastes.

NUCLEAR FLIGHT, edited by Lt. Col. Kenneth F. Gantz; Duell, Sloan & Pearce, Inc., New York, N. Y.; $4.00. Colonel Gantz has collected a group of essays, by military and civilian authorities, on the principles of and prospects for nuclear-powered flights. There are also sections on the current status of nuclear flight programs and the human element, particularly the radiobiological problems of such flight.

FLUID MECHANICS FOR ENGINEERS, by Maurice Albertson, James Barton, and Daryl Simons; Prentice-Hall, Inc., Englewood Cliffs, N. J., $13.00. This book carefully develops the basic principles of fluid motion, and in a well-illustrated text, applies these principles to various problems. Each of the 12 chapters is summarized for easy review, and includes questions for use as a textbook.

ELEMENTARY INTRODUCTION TO NUCLEAR REACTOR PHYSICS, by S. E. Liverhant; John Wiley & Sons, Inc., New York, N. Y.; $9.75. The author tries to teach a basic course in nuclear physics while explaining most of the fundamental ideas and problems of reactor engineering. Necessarily, the book is aimed at beginners: undergraduates, and engineers working with, but not specializing in, the field of reactor calculations.

FUNDAMENTALS OF ROCKET PROPULSION, by Raymond E. Wiech, Jr. and Robert F. Strauss; Reihold Publishing Corp., New York, N. Y.; $5.50. The rocket engine, from its history, through design, operation, and applications, is thoroughly explained in this book. Well-illustrated, it is more than a grade-school explanation, but still is not overly-technical. ▲▲

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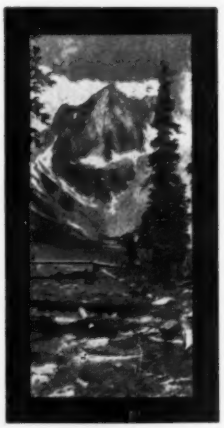

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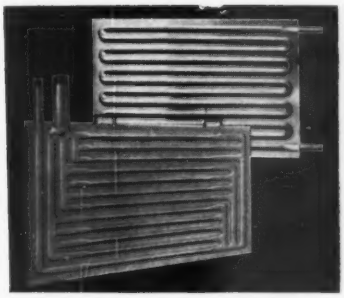

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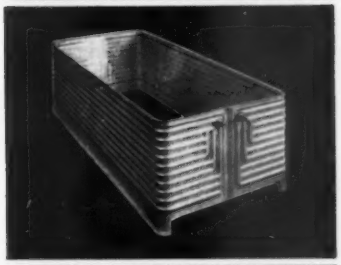

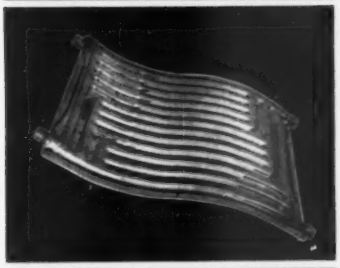

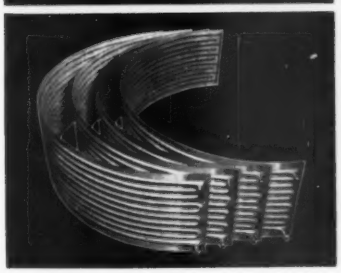

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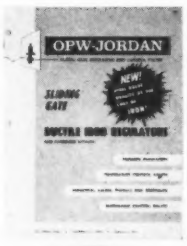

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Consulting Engineers' Calendar

Nov. 10. Consulting Engineers Council; Semiannual Meeting of Board of Directors, Pittsburgh, Pennsylvania.

Nov. 10-11. Kansas City Section, American Society of Civil Engineers; Power Conference, Continental Hotel, Kansas City, Missouri.

Nov. 15-16. Purdue University; Symposium on Engineering Applications of Probability and Random Function Theory, Campus, Lafayette, Indiana.

Nov. 15-17. Building Research Institute; Fall Conferences, Shoreham Hotel, Washington, D. C.

Nov. 27-Dec. 2. American Society of Mechanical Engineers; Annual Meeting and 24th National Exposition of Power and Mechanical Engineering, Statler-Hilton, New York, N. Y.

Nov. 29. American Institute of Consulting Engineers; Annual Dinner, Waldorf-Astoria Hotel, New York, New York.

Dec. 4-7. American Institute of Chemical Engineers; Annual Meeting, Statler Hotel, Washington, D. C.

Dec. 12-15. Atomic Industrial Forum; Atomfair-West, Masonic Memorial Building, San Francisco, California.

Dec. 12-15. Industrial Building Congress, New York Coliseum, New York, New York.

Dec. 12-15. American Nuclear Society; Winter Meeting, Mark Hopkins Hotel, San Francisco, California.

Dec. 14-16. Atomic Industrial Forum; Annual Conference, Fairmont Hotel, San Francisco, California.

Jan. 16-18. The Pennsylvania State University; Conference for Land and Construction Surveyors, Campus, University Park, Pennsylvania.

Jan. 16-19. Instrument Society of America; Winter Instrument-Automation Conference & Exhibit, Sheraton-Jefferson Hotel and Kiel Auditorium, St. Louis, Missouri.

Jan. 18-20. American Road Builders' Association; Annual Convention, Cincinnati, Ohio.

Jan. 23-Feb. 3. Cornell University; Short Course in Photointerpretation and Photogrammetry, Campus, Ithaca, New York.

Jan. 23-Feb. 3. University of California; 1961 Engineering and Management Course, Campus, Los Angeles, California.

Feb. 13-16. American Society of Heating, Refrigerating & Air-Conditioning Engineers; 15th International Heating & Air-Conditioning Exposition, International Amphitheatre, Chicago, Ill.

Feb. 20-23. American Concrete Institute; 57th Annual Convention, Chase-Park Plaza Hotels, St. Louis, Missouri.

Feb. 26-March 1. American Institute of Chemical Engineers, National meeting, Roosevelt Hotel, New Orleans, Louisiana. ▲▲

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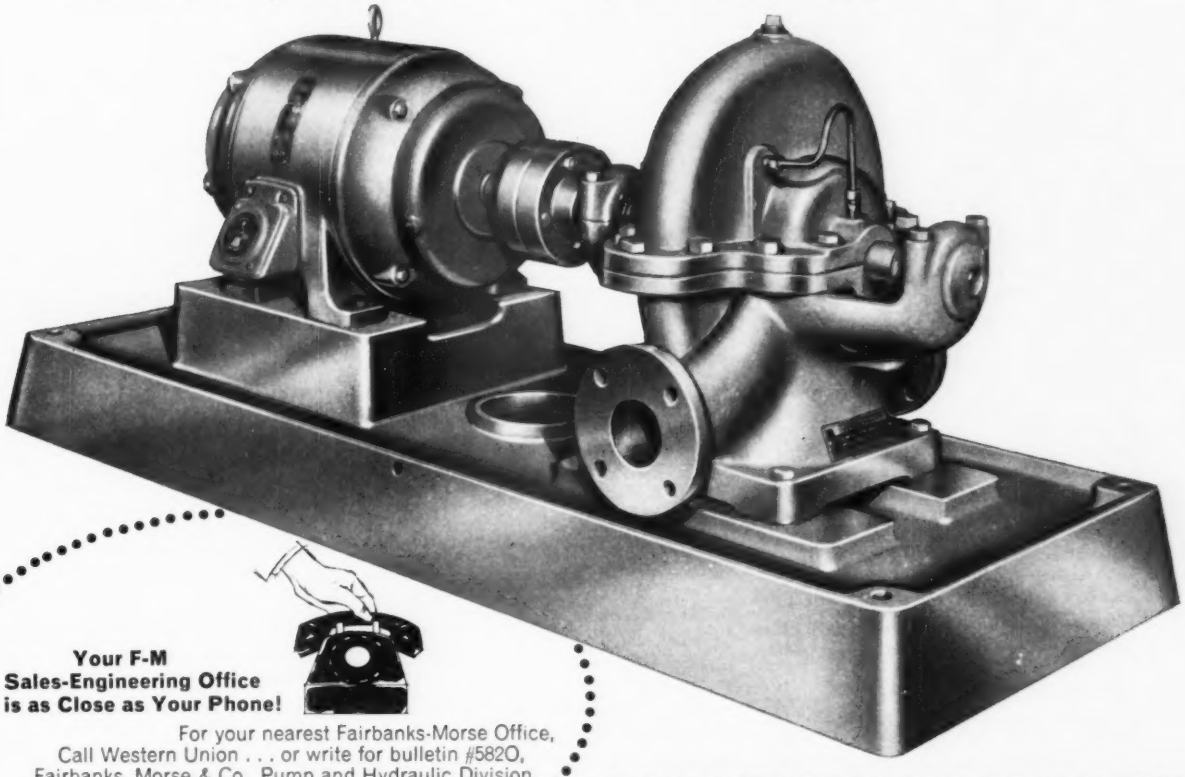

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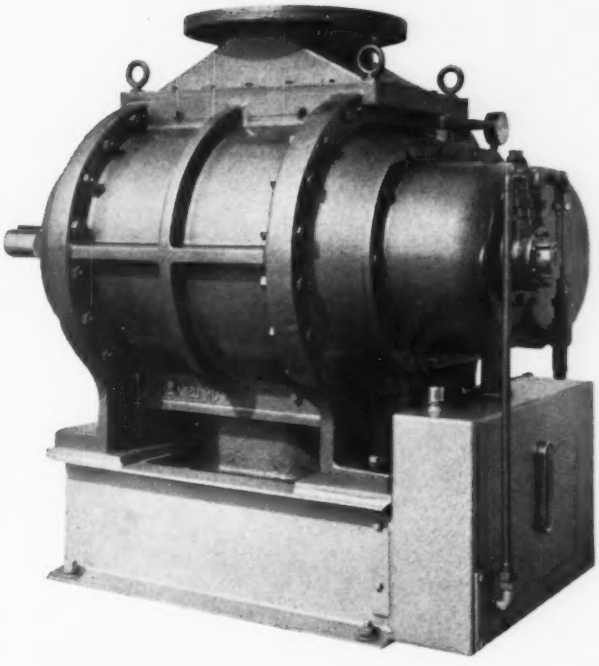
NEW SUTORBILT SERIES 3200 BLOWERS DELIVER HIGHER VOLUMES IN HEAVY DUTY SERVICE



The toughest high volume air and gas handling jobs are easily handled by new Series "3200" Sutorbilt lobe-type rotary positive blowers and gas pumps. One-piece shafts, precision machined helical timing gears and the special Sutorbilt timing hub are just some of the features carefully engineered into these new units for continuous, heavy-duty service and low maintenance operation.

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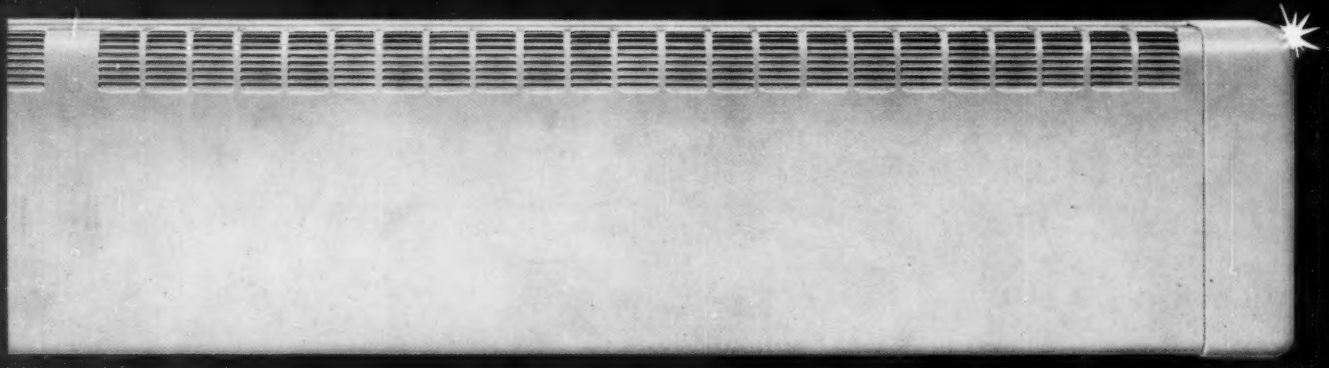
Nesbitt SILL-LINE

is often imitated

but never duplicated



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16-gauge enclosures fully braced at least every four feet to equal strength of 14-gauge	✓
The three-sided front locks to a full back panel to form the strongest unit-type assembly	✓
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Eight-step rust-inhibited baked enamel finish in a choice of six modern decorator colors	✓
Seven stock lengths of enclosure and heating element; any wall-to-wall fit without cutting	✓
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Wide range of capacities, from 700 to 2900 Btu per hr. per lineal ft. (steam)	✓
All ratings approved under the latest edition of the IBR testing and rating code	✓

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LOOK-SEE, my friend! Compare NESBITT SILL-LINE with any other manufacturer's wall fin type of radiation. Decide on the basis of what you can see and feel!

Start with Nesbitt's full one-piece back panel which fits anywhere, even over mullions, wall-to-wall without cutting, insuring perfect alinement and saving of wall trim. Then examine Nesbitt's three-sided front enclosure, die-formed, with turned edges. Note how this front interlocks with the back panel for the *full length of the top and bottom grilles*. Constructed of 16-gauge steel and *braced* from top to bottom at least every four feet, *this enclosure is as strong as one of 14-gauge — but without extra cost!*

Now examine the Nesbitt accessories — not "afterthoughts," like some accessories, but all smartly designed and expensively die-formed to complete the "world's most beautiful perimeter radiation."

Add Nesbitt's baked enamel finish — flawless result of an 8-step process under strict inspection.

Compare all the Nesbitt features with any others! Remember, like Confucius say: "Chinese copy cost less, worth less, is less. Take real thing, take Nesbitt!"

Like to have Nesbitt man bring you sample of Sill-line? You write us . . . he come, chop chop!

Sill-Line Radiation is made and sold by John J. Nesbitt, Inc., Philadelphia 36, Pa.

Nesbitt

5-2

Consulting Engineer

DIRECTORY OF ADVERTISERS' LITERATURE

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ST. JOSEPH, MICHIGAN

Part 2

November 1960

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AIR CLEANERS & DUST COLLECTORS

1—Electric Precipitators

Bulletin 104 describes electric precipitators manufactured by Buell Engineering Company. Line drawings show principle of operation and cutaway shows construction. The many features of this equipment are enumerated. Illustrations show installations in various types of industry. Nine installation steps given.

Buell Engineering Co.

2—Industrial Dust Collectors

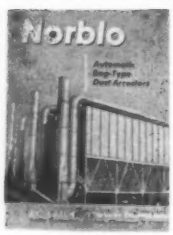
Catalog 359 describes briefly complete line of Torit dust collectors for industry. Current models of both self-contained cabinet cloth filter type and cyclone separators are illustrated with dimensions and specifications for each. Installation photographs illustrate all models in use. Accessories are listed.

Torit Manufacturing Co.

3—Air Filters

Bulletin B-1400-6 describes Farr's *Roll-Kleen* air filter. Comes in kit form to assemble at the point of installation. Line drawing shows construction and operation. Includes design, media, performance, installation, and maintenance. Tables show capacity in cfm and weight in lbs. Specifying instructions.

Farr Co.



4—Bag-Type Dust Collectors

How the *Norblo* automatic bag-type dust collector can provide continuous operation at full capacity is explained in four-page folder 164-5. Dimensions and capacities are listed in tabular form. A flow diagram explains how the unit works. Each part of the collector is shown separately with its description.

Northern Blower Co.

5—Air Purification Equipment

Bulletin 108A describes and illustrates *Dorex* activated carbon air purification equipment, C cells and H canisters. Data on equipment selection, installation, application is provided. Also given is information on unique *Dorex* replacement service. Discussions of activated carbon and conditions for proper purification.

Connor Engineering Corp.

6—Cyclone Dust Collectors

Bulletin 10-26-59 describes Dustex cyclone dust collectors for product recovery and dust nuisance elimination where ultra-high *Miniature* efficiencies are not required. Cutaway with captions pictures operating principles. Graph shows pressure drop across collector. Dimensions of various models.

Dustex Corp.

7—Electronic Air Cleaners

Catalog 1460 illustrates and describes the Model PA and PF Westinghouse *Precipitron* electronic air cleaner. Physical dimensions and capacities are given in tabular form. Included also are application features and cycle of operation. Addresses and telephones of sales offices.

Westinghouse Electric Corp., Sturtevant Division.

8—Dust and Mist Collectors

Bulletin 736 illustrates the entire Aget line and includes complete dimensions and specifications. Forty basic *Dustkop* units will collect everything from wood chips to fine dust particles. Also 4 *Mistkops*, 4 *Filterkops*, 2 *Dustbusters*. Descriptive copy and recommended uses for models. Photographs of installations.

Aget Manufacturing Co.

9—Fume Removal Systems

Bulletin 650 describes fully various systems for underfloor and overhead exhaust fumes removal. Ammerman's *Swing-O-Way* mounting permits 180° swing for the removal of diesel smoke, carbon monoxide, welding smoke, and spot ventilation. Includes photographs and line drawings of installations.

Ammerman Co., Inc.

10—Dust Filtering and Collection

Bulletin 2131-M83 describes the new Koppers Model K *Aeroturn* reverse-air jet dust filter for virtually 100% efficiency in dust filtering and collection. Bulletin illustrates the uncomplicated design, with drawings and photographs to show prefabricated sub-assemblies, flexibility, ease of erection. All features shown.

Koppers Co., Inc., Dust Filter Dept.

11—Glass Bag Filters

"Freedom from Hot, Corrosive Dust with Glass-Bag Filters" describes ways to lick tough air pollution problems. Bulletin 806 shows how the glass-bag filters in cement and metallurgical plants clean gases at temperatures up to 600°F. Two patented bag cleaning techniques also are discussed.

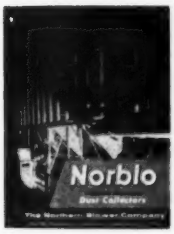
Dracco Div. of Fuller Co.

12—Gas Flow Model Studies

Bulletin issued by Western Precipitation covers gas flow model studies. The importance of studies in the recovery of industrial gases explained. Specific studies done in many companies are illustrated along with a brief outline of results. Types of testing are pictured. Lists firms using Western Precipitation's equipment.

Western Precipitation Div. Joy Mfg. Co.

AIR CLEANERS & DUST COLLECTORS *continued*



13—Bag-Type Dust Collectors

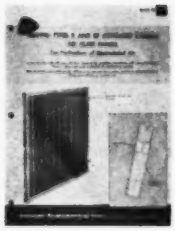
Bulletin 163-5 describes Northern Blower's standard bag-type dust collectors. Cutaway shows construction and principle of operation. Diagram gives dimensions. Capacities are included in table form for easy reference. Featured mechanisms are pictured and described. Photograph shows typical installation.
Northern Blower Co.

14—Cloth Type Dust Collectors

Bulletin 10-27-59 describes the *Roto-Jet* cloth-type dust collector designed by Dustex to eliminate usual cloth filter problems. Rotating blow tube and roller support system requires no reversing mechanisms, operates with low torque, prevents cloth jamming. Drawings illustrate operating principles.
Dustex Corp.

15—Shop Dust Collectors

Bulletin ED-58 describes Torit dust collectors to completely eliminate shop dust. These are particularly useful in school shops to protect students and instructors. Features are listed. Typical Torit exhaust system is pictured with accompanying diagramatic layout. Cutaways show operation of collectors.
Torit Manufacturing Co.



16—Activated Carbon Filters

Bulletin 107 describes and illustrates Dorex Types R and RF activated carbon air filter panels, low cost, high efficiency units designed to purify recirculated air. Ease of installation and simple refilling explained. Cutaway shows panels' function. Dimensional diagrams, capacities, methods of installation included.
Connor Engineering Corp.

17—Control of Dust and Fumes

Catalog G-100 describes precipitators, collectors, filters, scrubbers, processors, and heaters for controlling industrial dust and fumes. Various products are fully described. Illustrations show product and installations. Cutaways and line drawings show construction and operation. Many applications pictured.
Western Precipitation Div. Joy Mfg. Co.

18—Collecting Industrial Dusts

Bulletin 101 discusses methods of collecting industrial dusts. Describes dust; gives typical sources; shows tests that are made to determine proper application. Gives data on cyclones, electric precipitators, low resistance collectors, low draft loss collectors, dry classifying systems, special collectors, and others.
Buell Engineering Co.

19—Dust Collection Case Studies

Bulletin Series No. 740 describes dust collection problems in a variety of industries. These problems and their solutions range from single unit installations to complete systems, and from heavy industrial applications involving grinding, buffing, polishing, and woodworking, to the collection of lint.
Aget Manufacturing Co.

20—Disposable Filters

Bulletin B-1300-4 describes Farr's high efficiency, completely disposable filters designed for applications requiring maximum air cleanliness. Gives description application, advantages, and components. Specifications include capacities, dimensions, and weights. Graphs show resistance characteristics.
Farr Co.

AIR CONDITIONING & REFRIGERATION

21—Multi-Purpose Air Conditioner

Catalog 601 introduces new Nesbitt air conditioner for gymnasiums, showrooms, laboratories, and similar spaces. Nine basic sizes ranging from 2 to 130 tons cooling capacity, 36,600 to 1,390,000 Btu heating capacity. Exclusive Nesbitt return air bypass control available. Dimensions, capacities and selection data.
John J. Nesbitt, Inc.

22—Heating and Cooling Coils

Catalog HC-1 gives complete construction specifications and dimensions on the Bohn line of direct expansion, water, and steam coils. This engineering manual is tailored to the needs of a specifying and design engineer as it provides a wide range of capacity data in easy-to-use direct selection tables. Illustrated.
Bohn Aluminum & Brass Corp.

AIR CONDITIONING & REFRIGERATION *continued*

23—Central Plant Air Conditioners

Engineering catalog with illustrative and descriptive information and complete selection data on central plant conditioners, multizone conditioners, sprayed coil units, heating-ventilating units, cooling and heating coils. This catalog is notebook type and is index tabbed for easy and quick use.

Thermal Engineering Corp.

24—Compact Packaged Chillers

Catalag 8022A describes the new line of *Heat-X* "PC" package chillers for air conditioning systems, drinking water or beverage cooling applications, and industrial water cooling uses. Detailed specifications, capacity curves, dimension data for eleven models, 2-30 tons. Suggested specifications guide.

Heat-X, A Subsidiary of Dunham-Bush.

25—Zone Control Air Conditioning

New 20-page bulletin AC-220 gives complete information on Type PCB Zone Control air conditioning cabinets. For use where several zones require heating, ventilating, and air conditioning in varying degrees. Illustrated bulletin covers construction features, physical data, dimensions, fan performance, and ratings.

Buffalo Forge Co.

26—Marine Air Conditioning

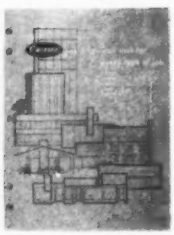
Bulletin K-254 describes a lightweight air conditioning system for tankers and cargo ships which uses sea water for cooling. The system is reported to eliminate corrosion and other damage caused by condensation in tanks and holds. Line drawing shows components and operation. Illustrations, histories.

Surface Combustion Corp.

27—No-Frost Freezing and Storage

Bulletin 105 shows improved apparatus to prevent frost accumulation on refrigerated coils of large scale freezing or cold room installations. Convenient disposal of condensed moisture and completely automatic, trustworthy refrigeration with rapid chilling of products and assured holding of low temperatures.

Niagara Blower Co.



28—Fan-Coil Units

The flexibility of the fan sections in this wide range (3 tons to 44 tons) of fan coil units makes them adaptable to a wide variety of versatile applications. Bulletin 38-216 describes and illustrates the magnitude of the Carrier fan coil line from residential to industrial models with ratings and data.

Carrier Air Conditioning Co.

29—Air and Light Diffusers

Catalog F-9768 describes Air and Light Diffusers contained in one unit and manufactured by Barber Colman Co. and Day-Brite Lighting, Inc. Illustrated with line drawings showing construction and operation as well as photographs picturing various models. Includes accurate performance data for proper selection.

Barber-Colman Co.

30—Dual Duct Air Mixing Units

Bulletin DD-6 describes dual duct air mixing units for high and low velocity systems. Detailed information includes blue prints showing different arrangements for same space, cross-section diagrams, dimensions, performance data, and complete specifications. Installation and product photographs are shown.

Buensod-Stacey, Inc.

31—Absorption Chilling Systems

Catalog EM 60-2236 describes the York absorption chilling system and how it operates. Outstanding features are listed and explained. Cycle diagram in full color shows operation with each color keyed to different element in the chiller. Specifications for various models are shown in table form.

York Corp.

32—Packaged Liquid Chillers

Catalog 91-511 describes and illustrates Acme's complete line of RF *Flow Cold* packaged liquid chillers. Offered in 8 models in capacities from 3 to 30 tons. Model RF chillers are available in with either single or dual compressors. Catalog furnishes complete selection data, dimensions, and specifications.

Acme Industries, Inc.

33—Evaporative Condensers

Bulletin 50 describes line of Marlo evaporative condensers, in three types—horizontal, vertical, low silhouette—20 sizes, capacities 3 to 250 tons. Bulletin includes photographs, drawings, construction features, performance charts, ratings, and specifications. Additional data also is included in bulletin.

Marlo Coil Co.

34—Air Conditioning Products

Catalog LL-349 covers in detail the many products for industrial and commercial aid conditioning manufactured by Chrysler Airtemp Applied Machinery and Systems Department. Includes data and ratings on packaged and liquid chillers, large central station packaged air conditioners, and air handling units.

Chrysler Corp., Airtemp Division.

AIR CONDITIONING & REFRIGERATION *continued*

35—Colplate Refrigeration

Bulletins 666 and 667 describe and illustrate how Dean *Colplate* is manufactured and applied in cold food display, service, and storage facilities such as counters, smorgasbords, cabinets, trays, bins, liquid coolers, freezer stands and rooms, locker plants, and many others. Specifications are given.

Dean Products, Inc.

36—Motorless Valve Attenuator

Bulletin K-45 describes the new Connor *Kno-Draft* Series 45P valve attenuator, which uses no motors or linkage of any kind, and is designed for use in dual duct high velocity air distribution systems. Features are listed, function explained and diagrammed, performance data, and dimensions.

Connor Engineering Corp.

37—Cooling Water Chemicals

Process Bulletin C2 describes the method for treating recirculating cooling water and process water systems plagued with hard-to-solve deposit problems. The Nalco method may be used alone, in conjunction with acid or supplemented by some other Nalco treatment. Drawing shows installation.

Nalco Chemical Co.

38—Curtain Wall Air Conditioners

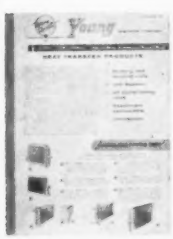
Bulletin PW-319 describes a new concept of curtain wall function, room-by-room air conditioning, an integral part of the Lupton curtain wall system. This is a true perimeter type system affording individual room control. It is a space saver and is easily installed. Includes capacities, dimensions, and specifications.

Michael Flynn Manufacturing Co.

39—Curtain Air Conditioners

An eight-page booklet of architect sketches showing different applications of the Lennox Comfort Curtain system for heating, ventilating, and air conditioning classrooms. An attractive two-color booklet, this brochure shows heater rooms and heating equipment integrated into the design of schools and libraries.

Lennox Industries Inc.



40—Air Conditioning Products

Catalog 261 contains illustrated, condensed data on the complete line of Young radiator heating, cooling, and air conditioning products for residential, commercial, and industrial applications. Complete specifications for each product in tabular form. Sales and engineering offices listed. Completely illustrated.

Young Radiator Co.

41—Packaged Sound Conditioning

Catalog 464-M76 describes Kopper's complete line of *Aircoustat* sound traps for use in air handling systems. Drawings show system with individual details of components. Three steps in proper selection are given in detail. Airflow tables for single and multiple units included. Suggested installation methods.

Koppers Co., Inc., Sound Control Dept.

42—Airfoil Bladed Fans

Bulletin A-1103 describes centrifugal type, airfoil bladed fans manufactured by American-Standard. Available for general ventilation and industrial process applications. For conventional low velocity or high velocity conduit and double duct air conditioning systems. Illustrations include models and components.

American-Standard Industrial Division.

43—Air Conditioners and Refrigerators

Bulletin RS2E covers line of air conditioning units, 3 through 60 tons, and packaged liquid chillers 7½ through 125 tons. Complete specifications including cooling capacity, dimensions, and weights are given. Units are illustrated. Other products manufactured by Curtis Manufacturing Company are illustrated.

Curtis Manufacturing Co.

44—Water Cooling Coils

Catalog 406 covers complete line of McQuay water cooling coils in four standard fin spacings for any requirement or design load. Describes coil construction, offers example coil selection problems, and includes section on direct selection. Provides an easier, more accurate selection of McQuay cooling coils.

McQuay Inc.

45—Central Station Air Conditioners

Bulletin AC1001A is prepared to provide the Consulting Engineer with a packaged 7½ to 60 hp complete, air conditioner engineering manual. No longer is a detailed specification of built-up equipment necessary. Needed is duct distribution and utility hook-up only. Tables, graphs, and diagrams are included.

Crane Co.

46—Copper-Alloyed Galvanized Steel

Bulletin WC-255 describes the ultimate in galvanized sheets for air conditioning ducts and other applications, *SofTite Cop-R-Loy* galvanized sheets. Description of product, how and where it has been used, its manufacturing process, and other subjects are covered in detail with words and photographs.

Wheeling Corrugating Company.

AIR CONDITIONING & REFRIGERATION *continued*

47—Air Conditioning Data File

A new high velocity data file is designed to help the air conditioning industry utilize the advantages of high velocity air transmission and distribution. It discusses what high velocity is, what it can do, and where it should be used, duct design, duct construction, and temperature control.

Barber-Colman Co.

48—Waterworks Air Conditioning

Bulletin K-354 demonstrates the savings possible in air conditioning waterworks pipe galleries with *Kathabar®* systems. Using the water as a coolant, these systems prevent condensation and its attendant maintenance costs. Line drawing shows components and operation. Illustrations and case histories.

Surface Combustion Corp.

49—Packaged Water Chillers

Acme Model HE *Flow Therm* packaged water chillers are described in Catalog 535-A, including construction details, complete specifications, dimensional and capacity data. The HE line offers 8 compact models, in capacities from 20 to 125 tons, all factory assembled, tested and ready to install.

Acme Industries, Inc.

50—Air Cooled Condensers

Catalog 7011A contains engineering and construction data for 4 remote air cooled condensers. "PFC" for well ventilated basement location; "LSBC" for outdoor ground or rooftop installation; "BC" and "BCW" for indoor or outdoor mounting. Catalog contains 26 sections including valuable reference tables.

Dunham-Bush, Inc.

51—Air Conditioning Units

Bulletin 230 describes Bohn's new line of remote air conditioning units. Capacity data is given for direct expansion, cold water, hot water, and steam. Six models provide cooling capacities from 2 to 15 tons to handle a wide variety of applications. Tables show refrigeration and air conditioning capacities.

Bohn Aluminum & Brass Corp.

52—Packaged Liquid Chillers

Bulletin RS10W describes Curtis packaged liquid chillers, 7½ through 125 tons, with either direct drive compressor, semihermetic compressor, or open reciprocating compressor. Basic chiller principle described and illustrated with schematic. Applications for various industries listed. Each type chiller illustrated.

Curtis Manufacturing Co.

53—Multi-Zone Air Conditioning

First complete reference data on design and layout for multi-zone installation practice. Text, 24 pages, covers construction details, design procedures, basic air distributing schemes, air handling apparatus, budget costs, automatic control, winter and intermediate operation, specifications. Valuable for the designer.

Buensod-Stacey, Inc.

54—Water Chilling System

Catalog EM 60-2235 describes the compact hermetic *Turbopak* used for various water chilling applications. Capacity 65 to 600 tons. Most compact hermetic centrifugal water chilling system. Cutaway shows operation and component parts. Operation is carefully explained. Diagram shows dimensions. Specifications.

York Corp.

To order personal copies of these bulletins, please fill out the card between pages 2 and 3 or 58 and 59.

55—Air Conditioner, Dehumidifier

Bulletin 140 describes means of precise manipulation of humidity and temperature, air-conditioning critical processes of drying, and holding heat-sensitive materials, using absorbent liquid to dry air at moderate temperature without refrigeration. Diagrams, photos, chart of dehumidification, units up to 20,500 cfm.

Niagara Blower Co.

56—Packaged Liquid Chillers

Catalog ME-123 covers "W" Series Packaged Liquid Chillers – 15 to 125 hp – with photographs, cutaway drawing, ratings, capacities, condenser capacity, physical data, and dimensional drawings on Chrysler Airtemp Applied Machinery and Systems Department's liquid chillers, commercial and industrial.

Chrysler Corp., Airtemp Division.

57—Coil-Type Spray Dehumidifier

Bulletin 37 gives complete information on Marlo coil type spray dehumidifiers for washing, cleaning, humidifying, dehumidifying, heating and cooling, available in 327 sizes, air volumes from 600 to 76,000 cfm. Bulletin includes design specifications, dimensional data, and engineering data.

Marlo Coil Co.

AIR CONDITIONING & REFRIGERATION *continued*

58—Induced Draft Cooling Towers

Catalog 22L-14 describes an entirely new approach to large capacity cooling tower design by Carrier. This new design concept results in reduced operating weight as well as lowering cubic space. Features 170 to 500 ton capacities with complete specifications and physical data. Cutaways shows construction.

Carrier Air Conditioning Co.

59—Control Performance Test Report

Barber-Colman Company of Rockford, Illinois, has issued a performance test report on an electric unit ventilator controls installation in Zion, Illinois. The 14-page report tells of advantages gained through ratio room and discharge control for accurate control of room temperature. Photographs and charts.

Barber-Colman Co.

COMMUNICATION & SIGNAL EQUIPMENT

60—Audio Products Select-a-Guide

Radio Corporation of America offers in one package Select-a-Guides on Modular Sound Systems, Microphones, Amplifier Systems, and Loudspeakers. These fold-out easy-to-use folders illustrate, describe, and give specification data on the products. This is the first time this convenient package has been offered.

Radio Corporation of America.

64—Manual Telephone Systems

Bulletin 133A illustrates a variety of manual telephone systems from two station telephone systems to 200 line switchboard system. Quick reference for choice of system to fill the varying communication needs in the school, office, factory, home, hospital, and hotel. Specifications are included.

S. H. Couch Co., Inc.

61—Central Sound Systems

Bulletin 1-8601 describes a wide range of sound consoles for school and institutional use. Includes economical package systems and large consoles custom assembled from stock panels. Designed for flexibility and expansion. Specifications available on any model. Consoles and components illustrated.

Rauland-Borg. Corp.

65—Bells and Chimes

Bulletin A-4 illustrates all Autocall bells and chimes. Tables show the dimensions of all sizes and charts show the amount of current required for any desired voltage. Bells are furnished in vibrating and single-stroke models, both in standard and weatherproof styles for interior and exterior.

Autocall Co.

62—Hospital Signaling Systems

Brochure HR describes up-to-date signaling and communication systems. Includes *Vokalcall* audio-visual nurses' call systems, and *Dial-IN* and *Pagesaver* doctors' in-and-out register systems. The functioning of each system is described and the benefits derived from its use highlighted.

Auth Electric Co., Inc.

66—Clock and Program Systems

Bulletin CL-572 describes the centrally controlled clock and program systems for schools, institutions, public buildings, and industry. Included is description of various systems illustrated with wiring diagrams. Features and applications of various types of clocks and audible signals are discussed. Specifications given.

Edwards Co., Inc.

63—Telephone Wires and Cables

Telephone Wires and Cables Catalog T-3-60 contains complete information on the use of the oscillated lay plate method of processing unit cables and catalog data for all types of telephone wires and cables for outside plant. Specification T-5 and Installation Catalog T-4 are also available.

General Cable Corp.

67—School Sound Systems

Brand new four-page brochure 8000 E-60 illustrates and describes all standard school sound systems. Covers equipment suitable for the smallest to the largest school units. Building block flexibility of console styles, panels and functions explained. Specification sheets furnished on request. Completely illustrated.

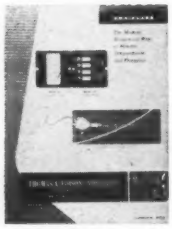
DuKane Corp.

COMMUNICATION & SIGNAL EQUIPMENT *continued*

68—Time Recording Systems

"First Quality for Timing Accuracy" contains general description of electronic, synchronous wired, and *Autoset* impulse time and program systems with illustrations of the master time control, secondary clocks, and signals. Also illustrated and described briefly are attendance time recorders, job cost recorders.

Stromberg, Div. of General Time.



69—Indicating and Alarm System

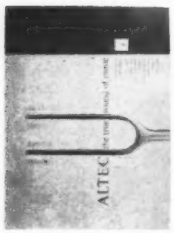
Bulletin 3036C describes in detail the Edison *Omniguard* indicating and alarm system. A reliable, low-cost temperature detection for small or large installations. Features, operation, specifications, connections, wiring diagram, and installation procedures are given. Various types are pictured and described.

Thomas A. Edison Industries.

70—Multiple TV Systems

Bulletin M-50-49 describes the Blonder-Tongue *Masterline* equipment for multiset operation in master and community TV systems. Consists of the main folder, an article on installing master TV systems in motels, catalog sheet of specifications, and price list. Bulletin is illustrated, includes amplifier specifications.

Blonder-Tongue Laboratories, Inc.



71—Stereo and Hi-Fi Music Systems

Altec's new catalog AL 1302-1 features illustrations of custom stereophonic and monophonic installations. A special feature is the selection which diagrams the proper placement of speakers and other components in a room. All components are described in detailed technical information and specifications.

Altec Lansing Corp.

72—Private Telephone Systems

Product catalog, Section IX, describes Stromberg-Carlson's Dial-X private internal telephone communications systems. Every component is fully illustrated and described to show how it can be applied in 10-line, 20-line, and 40-line systems. Applications, specifications.

Stromberg-Carlson, Commercial Products Division of General Dynamics Corp.

73—Modern Signal Systems

A pocket size resume of all Edwards products for industrial and commercial applications. It fully describes the advantages and convenience of modern signaling, covering the full range from large control, communications and protection systems to single components. Various products pictured.

Edwards Co., Inc.

74—Sound Specification Manual

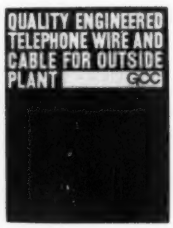
Engineering specification manual, 65 pages, gives complete detailed specifications on central sound systems for schools, industry, and institutions. Single, dual, and three channel systems are fully outlined with typical systems specifications covering the entire equipment for modern sound coverage.

Rauland-Borg Corp.

75—Annunciator Alarm Systems

Catalog AN-32 describes annunciator systems manufactured by Autocall. It clearly illustrates typical conditions and occurrences which may be indicated by Autocall annunciators. Numerous types are shown with schematic wiring diagrams, dimensions, control cabinets and desks, and plug-in relays.

Autocall Co.



76—Telephone Cables

Catalog T-5 contains an interesting historical outline of the development of telephone cables' insulations and jackets. Also included in this book are three specifications covering the manufacture of General Cable's new line of *Qualpeth* thermoplastic insulated telephone cables for outside the plant.

General Cable Corp.

77—Telephone Systems

Brochure 8002 describes DuKane private automatic telephone systems for any type of building requiring 2 to 200 or more telephones. Block specifications shown on 7 of 9 systems with each model illustrated. Special chart describes savings in increased efficiency. Additional information on request.

DuKane Corp.

78—Apartment House Communications

Brochure AP describes modern apartment house communication equipment and systems. Includes telephone systems, mail boxes, and non-electric door chimes all designed specifically for multi-family housing. Outstanding features are described and the benefits derived from the products are emphasized.

Auth Electric Co., Inc.

79—School Communication Systems

Bulletin 248 describes *Practi-Call*, the practical, all purpose communication system for schools manufactured by Standard Electric Time. What it is and how it works explained. Savings on equipment, installation, and maintenance outlined. Typical school layout diagramed. Components of *Practi-Call* pictured.

Standard Electric Time Co.

COMMUNICATION & SIGNAL EQUIPMENT *continued*

80—Public Address Systems

New catalog SWC 17e/AL describes and shows examples of Altec's sound system building block flexibility. Each specialized component illustrated in the catalog is designed to work in complete harmony with every other item in the Altec line-microphones, amplifiers, preamplifiers, loudspeakers, and horns.

Altec Lansing Corp.

81—Electronic Trainer

Brochure 3R3976 describes functions and method of Electronic Trainer, a building block workshop for effective teaching of electronic theory and practice. Learn-by-doing teaching device includes equipment for demonstrating fundamental and advanced electronic circuitry and transistors. Completely illustrated.

Radio Corporation of America.

82—Clocks and Signals

New engineers' and architects' catalog contains general descriptions, illustrations, specifications, and complete details on time and program systems (electronic, synchronous wired, *Autoset* impulse); clocks (secondary, synchronous, wall, double-faced, tower, special designs); signal equipment.

Stromberg, Div. of General Time.

83—Master TV System Manual

Master TV manual written especially for engineers designing master antenna signal distribution. Shows components used in master TV systems, engineers' specifications, glossary of terms, charts, and tables. Section contains information on how to calculate electronic signal gains and losses. Wiring diagrams included.

Blonder-Tongue Laboratories, Inc.

ELECTRICAL APPARATUS

84—New Metal-Clad Switchgear

New I-T-E 4160-volt stored energy metal-clad switchgear described in bulletin 2801-1A. Newly-designed equipment, smaller in every exterior dimension, offers spring-powered stored energy closing in a completely new metal-clad gear design; provides new convenience and safety. Illustrations and charts.

I-T-E Circuit Breaker Co.

85—Basic Electrical Protection

Booklet PBP, just released by the makers of Buss fuses, explains such terms as interrupting capacity, speed of response, and current limitation. Valuable information on motor protection, system selectivity to faults, fuse application, and fuse selection is given. Charts show time of opening and current limitation.

Bussman Mfg. Div., McGraw-Edison Co.

86—Single and Multi-Speed Starters

Describes single and multi-speed starters, including combination and reversing starters, plus Square D *Spin Top* enclosures for hazardous locations. Also describes motor control racks for field mounting of *Spin Top* enclosures and other equipment. Bulletin includes price and dimension information.

Square D Co.

87—Emergency Power Guide

Booklet 40-20205-DN927 is Caterpillar's guide book for emergency power. Describes in detail the three sources of standby power – central battery systems, two circuit systems, and emergency generator sets. Details many advantages of diesel generator sets. Selection data of proper diesel for specific application.

Caterpillar Tractor Co., Engine Division.

88—Static Voltage Regulator

Bulletin GEA-7068 describes the new transistorized static voltage regulator made by General Electric. New low-maintenance design eliminates contacts and moving parts and gives accurate regulation. Includes dimensional and wiring diagrams. Shows electrical components card-mounted for accessibility.

General Electric Co.

89—Electric Motors

New Westinghouse Life Line "A" motors set standards of motor performance for greater application flexibility. Stronger insulating materials, best electrical performance, improved accelerating torque, pre-lubricated bearings, dynamic balancing of moving parts, armorized frame and other features are explained.

Westinghouse Electric Corp.

ELECTRICAL APPARATUS *continued*

90—Electrical Wiring Devices

Catalog 60, 75 illustrated pages, describes complete range of electrical wiring devices. Both the interchangeable Despard line and the P&S conventional line. Everything from switches to fixtures to devices for every purpose are listed. A 15-page index and price list are also included in this catalog.

Pass & Seymour, Inc.

91—Low Voltage Circuit Breakers

Bulletin 4261-2B describes I-T-E's new *U-Re-Lites*, individually enclosed low voltage power circuit breakers. Information includes design, safety features, enclosure dimensions, selection chart, application data, and coil ratings. All features are illustrated photographically, as well as installation procedures.

I-T-E Circuit Breaker Co.

92—Wiring Devices for Industry

Bulletin describes and illustrates many Arrow-Hart wiring devices used in industrial applications and includes supplementary information of interest. An up-to-date review of grounding requirements illustrates latest advances in this area and new types of grounding devices are discussed.

Arrow-Hart & Hegeman Electric Co.

93—Wound Rotor Motor Controls

Bulletin describes starting and speed regulation equipment for low voltage wound rotor motors, up to 600 volts. Contains details of outstanding features, complete specifications, ratings, dimensions, prices, and information required when ordering. Various types of controls and cabinets illustrated.

Allen-Bradley Co.

94—Portable Diesel Generators

Bulletin describes AGSCO portable power. A 1100 KW portable diesel generating unit which is completely portable, easily transported, quickly installed, 60 or 50 cycle operation. Includes description of equipment and schematic drawing giving weights and dimensions. Complete unit illustrated.

A. G. Schoonmaker Co., Inc.

95—Liquid-Filled Transformers

Bulletin GEA-6832A describes distribution equipment transformers rated 112½ to 2500 kva, oil or Pyranol® filled, for conventional or unit substations. Outlines construction details, standard tests, accessories, and switches. Includes tables and diagrams giving electrical and mechanical characteristics.

General Electric Co.

96—DC Contractors and Relays

Catalog GEA-6821A describes all types of G-E contactors and relays for dc industrial control. Various types of controls are pictured using contactors and relays. Includes charted specifications, contact ratings, application data, wiring symbols, and panel layouts with dimensions on all types of controls.

General Electric Co.

97—Cables for Power Circuits

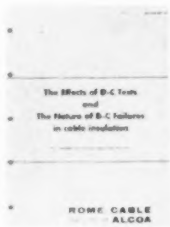
Bulletin 1037 describes Simplex *Anhydroprene XX* cables for power circuits up to 600 volts, designed for service in ducts or conduits or as open wiring in buildings. The jacket is a balanced compound of neoprene and other ingredients which provides balanced resistance to sunlight, oil, acids, heat, flame, abrasion.

Simplex Wire & Cable Co.

98—Multi-Metering Devices

Bulletin SL-27 describes Square D meter-breaker units and enclosures, fusible and non-fusible disconnect switches, service entrance terminal boxes and accessories. Bulletin also describes how E-Z Stack design simplifies multiple metering installations and shows suggested arrangements for 5 to 16 meters.

Square D Co.



99—DC Versus AC Testing

Summary of non-destructive testing of full production lengths of cable in a cable factory plus laboratory test data and field testing. Discussion includes location of insulation imperfections, evidence to cause of failures, testing after installation and merits of both methods of testing. Bulletin 712.

Rome Cable Division of Alcoa.

100—Self-Contained Power Centers

Bulletin 47-350 contains descriptive information and operating data regarding the new Westinghouse self-contained dry or liquid type power centers. Illustrations and technical information on application and rating capacities. Dry type transformers are ventilated or sealed and liquid units oil or *inerteen* immersed.

Westinghouse Electric Corp.

101—Terminating and Splicing Fittings

"O.Z. Terminating and Splicing Fittings for Interlocked Armor Cable," 36-page engineering bulletin 135A, gives complete specifications, dimensions, cutaway drawings, photographs, and installation instructions. Prices and weights also are given for each item, along with ordering data and available materials.

O. Z. Electrical Mfg. Co.

ELECTRICAL APPARATUS *continued*

102—Panelboard Circuit Breakers

Bulletin 3103 covers the Heinemann series 0911, an economical panelboard circuit breaker dimensionally interchangeable with other makes. Available in 1- and 2-pole models, 0.050 to 60 amperes, the 0911 uses hydraulic-magnetic actuation to end heat-induced nuisance tripping. Fast short-circuit interruption.

Heinemann Electric Co.

103—Storage Batteries

Bulletin 210, 24 pages, is a detailed technical manual on the use of stationary storage batteries for switchgear control, and emergency light and power. Includes information necessary for selection of batteries, racks, and chargers; proper maintenance.

Exide Industrial Division, Electric Storage Battery Co.

104—Potential Devices

Descriptive bulletin 745 covers S&C potential devices for low cost voltage monitoring through 161 kv. It includes details on application, construction, and operation, as well as outline and circuit diagrams. Specification page lists available ratings, styles, dimensions, and accessories.

S&C Electric Co.

105—Automatic Transfer Switches

Bulletin IR-0033 on Zenith transfer switches in emergency power systems. Describes switches mechanically held in normal and emergency positions, mechanically held in one position and electrically held in other, magnetically or electrically held in both. Also details and diagrams on designing systems.

Zenith Electric Co.

106—Power Circuit Transformers

Bulletin P571-15 describes Jefferson's power circuit transformers, the economical, efficient approach to better power distribution. Line drawings combined with tables give all dimensional data. Application data includes selection, mounting, and conversion. Also given are wiring diagrams and specifications.

Jefferson Electric Co.

107—Electrical Systems Design Book

Bulletin B7748 is for use by consulting engineers to prove that the best electrical system is the one which gives the greatest value per dollar of investment. Covers characteristics of good systems – flexibility, service continuity, voltage regulation, efficiency, operational cost, and maintenance. Helps in selection.

Westinghouse Electric Corp.

108—Secondary Substations

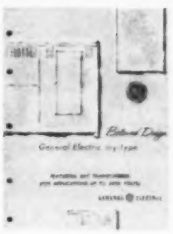
Bulletin 3104-1A supplies detailed information on secondary unit substations, complete and compact load distribution centers for indoor or outoor application. Gives data and specifications on a large variety of primary devices, transformers, and secondary switchgear offered in I-T-E secondary unit substations.

I-T-E Circuit Breaker Co.

109—Fibre Conduit

Catalog 52 describes Orangeburg's standard and Nocrete conduit for installation with and without concrete encasement. Manufacturing methods, advantages, and properties given. Method of joining and tooling pictured and explained. Fittings of various kinds are diagrammed and dimensions given.

Orangeburg Manufacturing Co., Inc.



110—Distribution Centers

Bulletin GEA-6928 describes GE's dry-type integral distribution centers featuring QHT transformers for applications up to 5000 volts. Installation instructions, features, dimensions and cable space, selection data, ratings, and panelboard components are included. Material specification form helps you specify.

General Electric Co.

111—Insulated Wire and Cable

Everything needed for the selection, design, installation, and operation of Kerite insulated wire and cable for light, power, and control service. Leatherette portfolio is tab-indexed to cover cable description, capacity, testing, technical tables, terminals, splices, and miscellaneous data of value to the consulting engineer.

Kerite Co.

112—Aluminum Plug-In Duct

Bulletin SD-110 describes Square D aluminum plug-in duct with I-beam construction of bus bars. The 6-page, 2-color bulletin explains use of plug-in duct, tells why aluminum is used as a conductor. Includes convenient voltage drop curves, suggested specifications, and list of available accessories.

Square D Co.

113—Squirrel Cage Induction Motors

Bulletin 201 covers Ideal Type "AP" squirrel cage induction motors rated from 25 to 1500 rpm and 514 to 1800 rpm designed for centrifugal blower, compressor, and pump applications. Complete performance data, emphasizing operating characteristics and construction features. Includes typical installation data.

Ideal Electric & Mfg. Co.

ELECTRICAL APPARATUS *continued*

114—Polyphase Motors

Bulletin MU-232 describes protected, open frame, drip-proof motors 250 through 1000 hp available from Wagner Electric Corporation. These motors feature heavy fabricated steel frames with double end ventilation and can be furnished with either split-type sleeve bearings or heavy duty ball bearings.

Wagner Electric Corp.

115—Packaged Transformer Units

Bulletin 5601-1A shows transformer, primary and secondary devices in compact package for easy installation at load area. Ventilated dry type, three phase, up to 500 kva and 5 kv. It's for indoors, is 38" deep x 75" long x 70" high. Shows interior arrangement, size and selection charts, lists optional features.

I-T-E Circuit Breaker Co.

116—Power Transformers

Booklet 7391 E describes in detail the 400 kV power transformers built by ASEA Electric. Booklet is a complete technical study of these transformers including charts, graphs, oscillograms, wiring diagrams, and line drawings. Completely illustrated with photographs including dramatic over-excitment tests.

ASEA Electric, Inc.

117—Voltage Distribution Systems

Bulletin 249 describes *Power-Flex*, the voltage system for high school laboratories. This system is flexible, complete, safe, compact, rugged, and Underwriters' Laboratories approved. Schematic of typical *Power-Flex* installation. Control center pictured and described. Service outlets and extension cords listed.

Standard Electric Time Co.

118—Brushless Generators

Bulletin 255A describes a line packaged synchronous generators. Ratings are between 6.25 KVA thru 187 KVA at 1200 and 1800 rpm, 60 cycle. Single or three phase output. The generators are completely brushless eliminating the need for the usual brush/commutation maintenance. Features illustrated.

Electric Machinery Mfg. Co.

119—Fuse-Fuseholder

New Buss fuse-fuseholder combination for protection of individual fluorescent fixtures and other equipment on circuits of 300 volts or less. Bulletin SFH-6 tells how individual fusing reduces hazards of fires and explosions. Bulletin specifies the size fuse to use and where to locate it for the best protection.

Bussmann Mfg. Div., McGraw-Edison Co.

120—Specification Manual

New manual SD-200 gives comprehensive specification data on Square D electrical equipment – safety switches, motor starters, panelboards, switchboards, dimmerboards, control centers, bus duct, and substations. The manual also contains convenient reference guide to National Electrical Code.

Square D Co.

121—Industrial Capacitors

Bulletin B-7642 describes Westinghouse capacitors. Major benefits you derive from use of capacitors together with proof of capacitor value explained. Includes selection and application data and calculating chart. Cutaway shows construction with components keyed. Rating tables and operational diagram.

Westinghouse Electric Corp.

122—Medium Transformers

Bulletin GEA-6108C gives descriptions, characteristics, performance data, weights and dimensions, standard and optional accessories of medium transformers. The graphically illustrated bulletin features transformers in ratings 501-10,000 kva, oil or Pyranol® filled, single or three phase and load tap changing.

General Electric Co.

123—PVC Rigid Conduit

Bulletin KE 1058 is a new 20-page rigid polyvinyl chloride electrical conduit catalog. Included are comprehensive test results, specification information, installation instruction, corrosion resistant charts, and other valuable data. Illustrations show various types of pipe and fittings. Pictures show proper assembly.

Kraloy Plastic Pipe Co., Inc.

124—Pressure Contact Switches

Bulletin 101 describes Barkelew's *Bolt-Log* load break service entrance switches. Furnished in 1200, 1600, and 2000 amp capacities for 240, 480, and 600 volt 60 cycle ac service. Two, three, and four pole, fused or unfused, front or rear connection. Mountings, construction, dimensions, and tests included.

Barkelew Electric Mfg. Co.

125—Aluminum Conduit Fittings

Catalog 59 lists, in condensed form, all types of aluminum conduit fittings made by Killark Electric Mfg. Co. Contains dimensional data of such items as circuit breakers, conduit bodies, connectors, explosion-proof vapor-tight and dust-tight fittings and fixtures. Catalog numbers keyed to separate price list.

Killark Electric Mfg. Co.

ELECTRICAL APPARATUS *continued*

126—Home Standby Electric Power

Bulletin F-150 describes Onan's standby electric power plant for the protection of the home against power interruption. Assures continued operation of heating system, lighting, water system, and refrigeration. Line drawings show components and dimensions. Model selection chart. Specifications and accessories.

D. W. Onan & Sons Inc.

127—Rigid Aluminum Conduit

Illustrated, detailed Manual KW-2 gives physical properties and performance factors of rigid aluminum conduit as compared to steel conduit. Subjects covered are weights and dimensions, allowable conduit fill, corrosion resistance, voltage drop, installation costs data, NEC information, safety factors.

Kaiser Aluminum & Chemical Sales, Inc.

128—Power Control Centers

Catalog SM-244, 16 pages, describes in detail the modern method for centralizing electrical power distribution and motor control equipment for industrial applications. It also contains suggested ideas for control specifications, and gives a simplified selector for use in control center layout and planning.

Square D Co.

129—Cable Support Systems

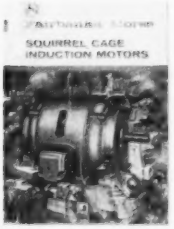
Catalog 103 describes Chalfant cable support systems. Chalfant cable trays, racks, and troughs are designed as the most economical and efficient method of support electrical armored cable, low voltage control cables, and process tubing. Made of aluminum, galvanized steel, or aluminized steel.

Chalfant Products Co.

130—Transformer Buyer's Guide

Bulletin 1047, Buyer's Guide, to help in specifying and ordering dry-type transformers. A quick and easy-to-use single source of specifying and ordering information. Pictorial index gives basic descriptions, application information, and page numbers on which prices, dimensions, and other data are found.

General Electric Co.



131—Squirrel Cage Induction Motors

Publication AEB450.6 describes the rerated line of F-M dripproof guarded motors in NEMA frames 182 through 445U. Motors are available in all mechanical and electrical types, either multispeed, high torque or intermittent duty. Cutaway shows construction and components are pictured.

Fairbanks, Morse & Co., Electrical Div.

132—Circuit Breakers and Enclosures

New *Speedfax* catalog ALS gives fast, full reference on circuit breakers and enclosures, *Tranfo-Units,* and high-voltage switching devices. Prices for breakers and enclosures are conveniently grouped by frame sizes. Selection charts show ratings, overcurrent devices, attachments, and breaker modifications.

I-T-E Circuit Breaker Co.

133—Steel Underfloor Duct Systems

Bulletin C-7089 describes General Electric's three steel underfloor wiring systems. Complete product information, layout design data, and suggested specifications can be found on G-E's single-duct, and two-level duct systems. Photographs and line drawings show component parts. Complete installation data.

General Electric Co.

134—Dry-Type Transformers

Bulletin 46-950 contains complete statistical information on single and three-phase dry type transformers. For each type transformer there are dimension and layout drawings, limit capacities, such engineering application data as decibel readings, space and weight saving features, case temperatures.

Westinghouse Electric Corp.

135—Exposion-Proof Receptacles

Bulletin CES-660 has been designed to provide you with information on all the latest improvements in Appleton's streamlined *Arc-Loc* "CES" and "CESD" Receptacles and "CPH" Plugs. Specifically for application in hazardous areas such as refineries, chemical plants, paint plants, fuel storage, and others.

Appleton Electric Co.

136—Transformers and Substations

Bulletin 960 describes engineering and installation advantages of Sorgel dry-type load center transformers and substations. Includes 15-point checklist in specifying transformer and substation gear. Equipment up to 10,000 KVA and for all voltages up to 15,000. Photographs, cutaways, performance curves.

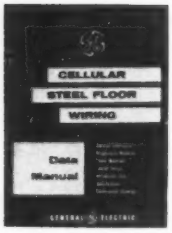
Sorgel Electric Co.

137—Accessories and Special Controls

Catalog 57-S7 provides diagrams, photographs, and complete information on ASCO breakglass switches, control stations for ASCO mechanically held switches and relays, engine generator isolating switches, marine duty transfer switches, phase sequence correctors, and relay panel for gas valves.

Automatic Switch Co.

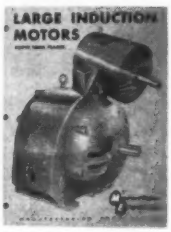
ELECTRICAL APPARATUS *continued*



138—Cellular Steel Floor Wiring

Bulletin C-17099 contains complete information on the General Electric *Cellular* steel floor wiring system. Complete description, photographs, and dimensional drawings of all components are included. Contains layout design information, suggested specifications, application data, and installation instructions.

General Electric Co.



139—Large Induction Motors

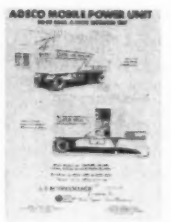
Bulletin SB-153 describes and illustrates large induction motors in sizes above NEMA Frames. Shows construction details of rotors, stators, coil lasting and bearing. Also shows various types of enclosures; open dripproof, splashproof, explosion proof, weather protected and separately forced ventilated.

Marathon Electric Mfg. Corp.

140—Lightweight Metallic Cable

Bulletin 1038 describes Simplex C-L-X, the lightweight, corrugated, impervious metallic cable sheath available in three new metals. Previously made of steel, C-L-X cable systems may now be ordered with copper, aluminum, or bronze flexible coverings. Advantages of the new metals are enumerated.

Simplex Wire & Cable Co.



141—Mobile Diesel Generators

Bulletin describes AGSCO 300 kw diesel-electric mobile generating unit. Suitable for any standard voltage, 3 phase, 60 cycle, for parallel operation. This power plant on wheels is pictured. A schematic drawing shows components and gives dimensions. Equipment specifications include accessories.

A. G. Schoonmaker Co., Inc.

142—Emergency Power Manual

Professional Manual SP1020 contains new specifications, price lists, technical bulletins and catalogs covering complete new line of Onan emergency generating plants up to 230kw. Includes gas, gasoline, and Diesel-driven units. New *Magneciter* generators described and *Instapac* inverter bulletin included.

D. W. Onan & Sons Inc.

143—Synchronous Motor Controls

Bulletin 6092 deals with starting and speed regulation of low voltage wound rotor motors, up to 600 volts. Cutaway shows construction and components. Advantages are outlined in detail. Includes photographs and wiring diagrams. The Allen-Bradley line of synchronous starters illustrated and described.

Allen-Bradley Co.

144—Load Break Switches

Complete line of Pringle load break switches are described in loose-leaf catalog. Detailed photographs show switches in open and closed positions. Section gives complete engineering data. Test data on temperature and performance. Gives complete information on industrial grounding. Wiring diagrams.

Pringle Electric Manufacturing Co.

145—"Rocker-Glo" Switches

Illustrated four-page brochure describes new *Rocker-Glo* switch by Pass and Seymour. It has a luminous button and operates silently. Available in 15 or 20 amp, 120/277 volts ac. It has easy-to-wire pressure or screw terminals. Comes in Despard type with strap or Despard interchangeable.

Pass & Seymour, Inc.

146—Corona Level Measurements

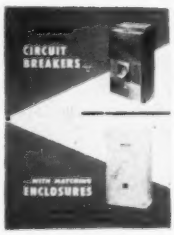
Bulletin RCT 711, reprint of conference paper, discusses detectors, standards and sensitivity, equipment installation and operation, testing techniques, field testing, future development and applications and I.P.C.E.A. test procedure on insulated cables. Photographs show testing equipment.

Rome Cable Division of Alcoa.

147—Magnetic Motor Controls

Bulletin A-262-R explains Arrow-Hart's new ambient compensated overload relay and relates how Type RA magnetic motor controls offer greatly reduced size and weight, without sacrificing performance and dependability. Open controls show construction and give dimensions. Important features illustrated.

Arrow-Hart & Hegeman Electric Co.



148—Circuit Breakers and Enclosures

Bulletin GEA-6754 describes G-E's complete line of molded case breakers with matching enclosures. Advantages and selection data. Cutaway is keyed to descriptions of components. All breakers illustrated. Dimensions given. Checklist of modifications and accessories included.

General Electric Co.
Circuit Protective Devices Dept.

149—Duct Floors for Electrification

Sixteen-page booklet, "Electrical Outlets Wherever You Need Them," gives complete details on RLC duct floors, a new development which provides 100 percent electrical flexibility for buildings at a remarkably low cost. The illustrated booklet is published by the Concrete Steel Reinforcing Institute.

Concrete Steel Reinforcing Institute.

ELECTRICAL APPARATUS *continued*

150—Stationary Battery Chargers

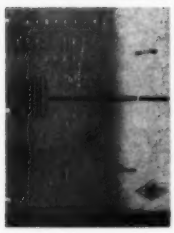
Bulletin 6256 contains technical data for selection and use of Exide constant-voltage, silicon-rectifier (UR) chargers for stationary batteries. Curves and statistics on charger performance at various electrical loads, diagrams and instructions for installing alarms and ground detection systems.

Exide Industrial Division.

151—Portable Cords and Cables

Portable cords and cables are described in new manual KW-915. Book gives pertinent data on insulation compounds *(Laytex, Eonite, Kalzone)* and jacket compounds (neoprene and synthetic rubber). Various types of portable cords and cables are listed including specifications. Splicing, patching procedures.

Kaiser Aluminum & Chemical Sales, Inc.



152—Circuit Breakers

"What You Should Know About Circuit Breakers for Branch Circuit Protection," 16-page manual 101, describes ways of protecting your client from fire, equipment damage, excessive wiring costs, and needless circuit interruptions. How hydraulic-magnetic circuit breakers provide this protection is pointed out.

Heinemann Electric Co.

153—Metalclad Switchgear

This 36-page brochure describes S&C metalclad switchgear. Application and performance, components, specifications, and accessories are described and illustrated. Photographs and diagrams show how metalclad switchgear is used in industrial distribution systems. Exerpts from 1959 National Electrical Code.

S&C Electric Co.

154—Motors, Generators, and Controls

Bulletin 100 traces the history of Ideal Electric and its products from 1903 to the present. Indicates types of equipment currently offered including large electric motors, generators, motor-generator sets, switchgear, and controls. Shows application to various phases of industry. Pictorial of progress in the power field.

Ideal Electric & Mfg. Co.

155—Low Voltage Circuit Breakers

Bulletin 6004-C provides a complete review of I-T-E Circuit Breaker Company's new low-voltage power circuit breakers and switchboards. They range in unit ratings from 225 to 4000 amperes. Advanced features of the new K-Line breakers, rated at 225, 600 and 1600 amperes, are described.

I-T-E Circuit Breaker Co.

156—Substation Transformers

New bulletin 5800-1A describes liquid-filled units – single and three phase, 501 to 10,000 kva, up to 69 kv. Includes information on tank, coils, cores, core and coil assembly, instruments, controls, standard and optional accessories, dimensions for single and three phase transformers, and specification guide.

I-T-E Circuit Breaker Co.

157—Electrical Fittings

Loose-leaf catalog 135 has been prepared to provide all the technical information you need to select the right conduit fittings, cable terminators, cast iron boxes, and solderless connectors for each of your electrical installations. It includes a comprehensive index and a section of useful engineering data.

O. Z. Electrical Mfg. Co.

158—Underfloor Duct Systems

Catalog 203 describes the Orangeburg underfloor duct system, non-metallic underfloor raceways for distribution of electrical wiring in commercial, industrial, and institutional buildings. Drawing keyed to index shows components, which are also pictured and described. Instructions for installation given.

Orangeburg Manufacturing Co., Inc.

159—Explosion-Proof Fittings

Catalog of aluminum explosion-proof fittings for hazardous locations. Included are junction boxes, conduit bodies, sealing fixtures, plugs and receptacles, pilot lights, switches, and fixtures. Complete dimensional data makes ordering easy. Special fittings made to order. Catalog numbers keyed to separate price list.

Killark Electric Mfg. Co.

160—Circuit Breaker Accessories

Bulletin GEA-6757 describes G-E's complete line of circuit breaker accessories for use in solving complex control problems. Checklist gives accessories that can be used with various types of circuit breakers. Includes schematic wiring diagrams and dimensions.

General Electric Co.
Circuit Protective Devices Dept.

161—Reduced Current Motor Starting

Bulletin MU-251 describes increment motor and starter combinations that start squirrel-cage motors economically, efficiently and in keeping with power company regulations. Combinations are available to start motors in two or more steps without opening line. Voltage fluctuations kept to minimum.

Wagner Electric Corp.

ELECTRICAL APPARATUS *continued*

162—Protective Fuses

Bulletin HCS tells how Buss *Hi-Cap* fuses have unlimited interrupting capacity on any voltage up to 600 to provide safe protection for loads above 600 and up to 5000 amperes. Describes operating characteristics and advantages, illustrates dimensions, contains charts on current limiting effect and opening times.

Bussmann Mfg. Div., McGraw-Edison Co.

163—Aluminum Plug-in Busway

Bulletin GEA-6173 describes DE Aluminum Plug-in *Flex-A Power* Busway rated 225 to 1000 amperes. DE Busway is available in three-wire, three-phase and four-wire, three phase designs for maximum 600 volt applications. Bulletin includes weights, dimensions, ratings, applications, layout, and specifications.

General Electric Co.

164—Molded Case Circuit Breakers

Fundamentals of short-circuit protection for motor circuits in bulletin 5040-A which reviews the features and applications of E-T-I molded case breakers. Bulletin tabulates instantaneous trip range of E-T-I frame sizes and suggested trip setting positions for various horsepower motors.

I-T-E Circuit Breaker Co.

165—Frame Circuit Breakers

Square D Type A1B E Frame circuit breakers are described in bulletin SD-121. Single, two, and three pole breakers are available in 15 through 100 ampere trip ratings for both ac and dc systems. Bulletin also describes panelboards rated up to 600 amperes and approved for copper or aluminum cable.

Square D Co.

ENGINEERS' OFFICE & FIELD EQUIPMENT

166—Portable Microfilmer

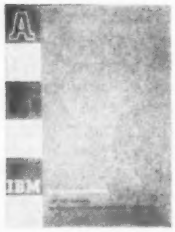
Bulletin A-948 describes the new Recordak portable microfilmer. Illustrated in full color, this six page folder explains and illustrates the outstanding features. This portable microfilmer weighs less than an office typewriter, 24 lbs, and measures 6½" x 15¾" x 12¾". Fits compactly into a handy carrying case.

Recordak Corp.

167—White Printer

Bulletin 2720 describes the Bruning *Copyflex* Model 300 white printer with a 39" printing width. The compact "300" provides exceptional print quality at a cost of little more than a penny per square foot. Brochure includes complete specifications and installation data. Series of photographs show operation.

Charles Bruning Co., Inc.



168—Earth Excavation Computer

Manual E26-1516 describes the problem of computing earth excavation and embankment volumes for highway design, using the solid-state IBM 609 calculator. In addition to formulas and program, materials included are input and output cards and survey data sheets. Charts and graphs are included.

International Business Machines Corp.

169—Electronic Digited Computer

Brochure S-526R1 describes the Royal Precision LGP-30, a desk-sized, stored-program, general purpose electronic digital computer. Specifications and features are listed and illustrated. New optional photo-electric punched tape reader and high-speed punch unit illustrated. Components described and pictured.

Royal McBee Corp.

170—Low Cost Computer

Bulletin AB-059 describes the Bendix G-15, a low cost, easy to use, general purpose digital computer. Shows basic computer and explains automatic programming. General specifications are given. Shows a wide variety of standard accessories so user may expand his facilities as he grows. Sales offices listed.

Bendix Computer Division.

171—Print Making Problems

Catalog SPD2 illustrates and describes actual case histories of specific drafting and print making problems that have been solved by the use of certain advanced techniques and products that have been developed by Eugene Dietzgen Company. This well illustrated booklet outlines problems and solutions.

Eugene Dietzgen Co.

ENGINEERS' OFFICE & FIELD EQUIPMENT *continued*

172—Data Processing System

Booklet 520 introduces the desk-sized IBM 1620, designed primarily to process research and engineering problems. Speed and capabilities are listed together with the advantages to be derived from this advanced storage and computing system. Programming systems available for use with the 1620 are shown.

International Business Machines Corp.

175—Blue Print Racks

Bulletin describes *Glider* blue print racks manufactured by Momar Industries. Advantages of using this equipment outlined. Models are illustrated together with accessory shelf, file cabinet, and extension racks. Detail photographs show direct-clamp action of plan holders. Also enclosed is price list of equipment.

Momar Industries.

To order personal copies of these bulletins, please fill out the card between pages 2 and 3 or 58 and 59.

176—Electronic Computing System

Complete specifications on the new RPC-4000 electronic computing system are given in brochure S-483. The RPC-4000 is a fully transistorized, electronic stored program, general purpose computing system, for both engineering and business data processing. System is modular and offers complete flexibility.

Royal McBee Corp.

173—Data Processing System

Bulletin QC-020 describes the Bendix G-20, system for computing engineering and scientific problems; making statistical studies; and data processing. Various arrangements show efficient computing at minimum cost to systems plant-wide or world-wide. Shows accessories which can be added to the basic system.

Bendix Computer Division.

177—The Story of World Trade

Booklet describes new pattern of international trade. Traces progress and history of international trade from the time of the ancient Egyptians. Explains how the foreign economic revolution effects our economy. Offers solution for this low-wage competition from abroad. Complete with pictures, and maps.

E. I. du Pont de Nemours & Co.

174—Reducing Printer

Revolute's Reducing Printer, reduces large prints ⅛ to ⅜ for convenience and economy, while retaining enough dimension to read print detail. Lockheed Aircraft, described in bulletin A2678, reduces their full-size drawings up to 42″ to half-size 21″ prints for distribution. Includes photographs and diagrams.

Charles Bruning Co., Inc.

178—Microfilming Systems

A presentation of modern microfilming in booklet form by Recordak, the originator of modern microfilming. Explains the system in precise form. Show sample films of the various steps in recording a specific engineering drawing. Finally reproductions of the film printed on opaque and translucent vellum stock.

Recordak Corp.

FIRE PROTECTION EQUIPMENT

179—Fire Alarm Systems

Bulletin 131A explains, "What is a Couch local fire alarm system?" It tells how to select, from a complete line of systems, the modular fire alarm system for your institutional, commercial, or industrial building. Each of your system layouts include wiring diagrams, specifications, and a variety of optional features.

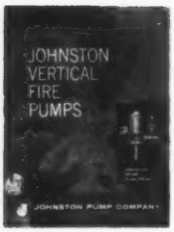
S. H. Couch Co., Inc.

180—Interior Fire Equipment

Catalog covers all types of fire protection equipment with technical data and art: sprinkler, CO_2, dry chemical, and foam systems; smoke detecting and alarm systems; hose racks and cabinets; hose, nozzles, and fittings; various types of portable extinguishers. Nine famous brands, 1200 products, from one source.

Fyr-Fyter Co.

FIRE PROTECTION EQUIPMENT *continued*



181—Vertical Fire Pumps

Descriptive data on new line of vertical fire pumps that operate independently of regular water mains. Ideal in industrial and commercial uses with UL approval for all 12 basic capacities-pressure ratings 500, 750, 1,000, 1,500 gpm; 100, 125 and 150 psi. Pumps cannot overload driver at any capacity.

Johnston Pump Co.

182—Fire Hydrants

An AWWA compression type, dry head fire hydrant with swivel flange below nozzles permitting nozzle section to be rotated 360° without removing bolts. Outer protection case permits removal of complete barrel for replacement or repairs without excavating. Bell, mechanical joint or flange pipe connections.

R. D. Wood Co.

183—Fire Hydrants

Bulletin W-8879 describes Mueller's fire hydrants and gate valves. Photographs illustrate two and three way hydrants and each type of gate valve. Cutaway wash drawings show construction and operation. Precision engineered, these products meet the exacting specifications of the AWWA. Specifications included.

Mueller Co.

184—Fire Vents

Bulletin FY-R59 is a technical report on how fire vents reduce fire destruction to commercial and industrial property. The*Smokehatch, Smokeport,* and *Pyroport* vents are illustrated and described. Included are suggested specifications and line drawings showing operation. Fire hazard rating charts on all models.

Penn Ventilator Co., Inc.

HEAT EXCHANGERS & WATER HEATERS

185—Platecoil

This bulletin, 59-PI, describes and illustrates the new *Platecoil* configuration. It contains pertinent information on construction, application, and advantages in heat transfer. Specifications, size, weight, and surface area of standard units are listed. Varied applications are pictured and discussed.

Tranter Manufacturing Co.

186—Heat Exchanger Manual

This catalog contains an engineering section that provides the engineer with the means to make size estimates of heat transfer equipment. It helps the engineer to select a heat exchanger that will provide economy of service, precise operation, and long life. Contains thermal standards and reference data.

Condenser Service & Engrg. Co., Inc.

187—Water Heating Guide

Concerned with the problem of furnishing hot water for large buildings? Write for a copy of booklet TH-160 on indirect type instantaneous water heaters, their application, selection, and installation. Indirect type water heaters obtain heat from the same hot water or steam boiler that furnishes heat for the building.

Bell & Gossett Co.

188—Gas-Fired Water Heating Systems

A Guide to the proper sizing, selection, and installation of gas-fired water heating systems for all types of restaurants and cafeterias. Various types of dishwashing equipment are described. Basic information is furnished on water and gas piping, venting, and required clearances. Diagrams and cutaways.

American Gas Association.

189—Platecoil Technical Data

Three pages for *Platecoil* Technical Data Manual now available, picture and describe 5 *Platecoil* installations. Heating, cooling, cryopumping are discussed. Fourth page has a chart to help calculate mean temperature difference for heating or cooling, and a chart of pressure drop versus flow rate of water.

Tranter Manufacturing, Inc.

190—Panelcoil Heat Transfer

Bulletins M8 and M13 and 668 describe and illustrate how *Panelcoil* is made in single and double embossed types and show how it takes the place of pipe coils and tank jackets in industrial processing, handling and storage and food service equipment. Show details of applications for heating and cooling.

Dean Products, Inc.

HEATING & VENTILATING EQUIPMENT

191—Heavy Duty Heating Coils

Bulletin B-1518 presents the first complete line of heavy duty heating coils designed and built to meet the rigors of industrial service. Advantages, materials, and construction outlined. Each type of coil is illustrated and specifications are shown in chart and diagram. Selection data in charts, graphs and diagrams.

American-Standard Industrial Division.

192—Industrial Fans

Bulletin L-5 describes Lehigh's line of industrial fans. Includes tables, specifications, photographs, and drawings. Rating tables show air volumes, rpm, hp at static pressures, and outlet velocity and velocity pressures. Also correction ratios and fan laws.

Lehigh Fan & Blower Division, Fuller Company.

193—School Heating and Ventilating

Bulletin CC-601 provides school heating, cooling, and ventilating information, especially application of Lennox Comfort Curtain system. Covers research and air distribution, heat gain and loss. Heat source of warm air, hot water, steam, electricty, heat pump; use of outdoor air and mechanical cooling.

Lennox Industries Inc.

194—Direct-Connected Vaneaxial Fans

Bulletin 475 covers new Aerovent direct-connected vaneaxial fans, equipped with removable vane sections to facilitate installation and simplify routine cleaning and maintenance. Furnished in sizes 18″ to 48″ for capacities to 67,300 cfm, these high-efficiency units offer top performance against resistances to 6″ SP.

Aerovent Fan Co., Inc.

195—Infra-Red Industrial Heaters

Bulletin PC 158 30-3 describes *Panelbloc*, the infra-red radiant industrial heater. Brochure explains the many advantages of infra-red heating over conventional type heating. Typical industrial and commercial applications are pictured. Includes data on construction and operation as well as specifications.

Bettcher Manufacturing Corp..

196—Quiet Operating Fans

The *Acousto Fan*, which features a *Flow-Nozzle* air foil wheel designed specifically for quiet operation, is described in Bulletin 592. Quiet zone selection tables make an automatic selection of the quietest possible fan. Capacities range from 6000 cfm to 220,000 cfm, static pressure 3 in. wg through 11 in. wg.

New York Blower Co.

197—Exhaust Fan Ventilators

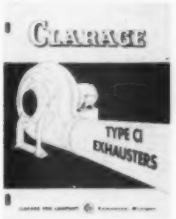
Bulletin SPV-18 details Burt free exhaust fan ventilators, designed for extremely fast removal of contaminated air. Air-shaft dampers open automatically to vertically exhaust an unrestricted column of air, and close to thoroughly weatherproof unit when motor is shut down. Capacities are available to 75,550 cfm.

Burt Manufacturing Co.

198—Compact-Type Steel Boilers

Catalog SB107 gives new SBI ratings and engineering details on the Burnham *Compact-Type* steel boiler. Designed to compress maximum heating capacity into minimum floor space. It is available for oil, gas, and coal firing. Capacities from 2,930 to 39,370 sq ft SBI net steam EDR new ratings.

Burnham Corp., Steel Boiler Department.



199—All-Purpose Exhausters

Catalog 707 describes Clarage's new line of Type CI cast iron fans for general purpose industrial and commercial air handling. Handles volumes to 3800 cfm, pressures to 18 in., temperatures to 750°F. Built in 5 arrangements, 3 different wheel types, and 6 sizes. Arrangements and wheel types pictured.

Clarage Fan Co.

200—Belt-Driven Tubeaxial Fans

Bulletin 625, eight pages, describes Type BT and BTV tubeaxial fans in 30 to 60 inch sizes. Designed for handling high temperatures, corrosive and explosive fumes, abrasive dusts, dirt laden air, high humidity. Also lists general fan laws, data on system and open surface tank ventilation, and duct resistance.

Robbins & Myers, Inc., Propellair Div.

201—High Velocity Air Duct

Catalog describes uses and applications of spiral pipe and welded fittings for air handling. Information on construction, lengths, diameters, material, and specifications included. Various advantages listed. Complete data on United sound absorbers. Diagrams show standard, low loss, and accessory fittings.

United Sheet Metal Co., Inc.

202—Air Diffusers

Bulletin K27-A illustrates and describes linear and rectangular series air diffusers. Offered in three series – square, panel, long-slotted – units combine best air distribution and modern styling. Dimensional drawings for several types in each series provided. Complete selection and performance data, list of agents.

Connor Engineering Corp.

HEATING & VENTILATING EQUIPMENT *continued*

203—Industrial Space Heaters

Twelve-page bulletin describes OG-581 new design space heater. Gas, oil, or combination dual fuel burners with push-button changeover. Output from 280,000 Btuh on up. Rugged construction with completely enclosed burner adaptable for space heating, ventilation, make-up air, process heating, air conditioning.

Lennox Industries Inc.

204—Surface Unit Heaters

Catalog 956 describes *Grid* cast iron steam heat transfer surface unit heaters, blast heaters, and radiators. Describes and illustrates one-piece construction. Included are air distribution charts, heating capacities, conversion tables, and specifications. This four-section catalog with tab index is well illustrated.

D. J. Murray Manufacturing Co.

205—Radiant Panel Heating

"Radiant Panel Heating with Steel Pipe," 48 pages, covers the history of this type of heating, basic design, floor, ceiling, and wall panels, information on snow melting systems, pipe coil integration, design of a floor coil system, and a boiler hook-up diagram.

Committee of Steel Pipe Producers, American Iron and Steel Institute.

206—Large Volume Ventilators

Catalog 575 describes McQuay's *Seasonvent* volume ventilator suitable for all heating and ventilating applications. Various arrangements are diagramed and applications pictured. Includes complete selection data, dimensional data, accessories and engineering specifications. Cutaway shows construction and operation.

McQuay Inc.

207—Finpipe Radiation

Catalog ADJ-005-R-760 illustrates and describes the Crane *Sunnywall Finpipe* radiation, the ideal choice for factories, hospitals, schools, offices, garages, apartments, warehouses, and similar structures where heating equipment must be able to withstand long years of hard service with minimum maintenance.

Crane Co.

208—All-Purpose Centrifugal Fans

Catalog 1120-1 describes Westinghouse Series 3000, all purpose centrifugal Fans. Standard construction features and optional accessories are illustrated and described. Graphs, charts, and diagrams give testing, rating, application, and selection data. Includes complete specifications for all models and sizes in tables.

Westinghouse Electric Corp.

209—Heating and Ventilating Units

Bulletin 9727 describes American-Standard heating and ventilating units, for both draw-thru and blow-thru applications. Offered in 11 sizes for 600 to 66,000 cfm. Cutaway shows construction. Complete information on coils, fans, and accessories. Details of construction, heating capacity and fan capacity charts.

American-Standard Industrial Division.

210—Roof Exhausters

Bulletin 100-1959 describes Ammerman's PB and BCD *AirXpeler* power roof exhausters fabricated of aluminum or molded reinforced fibreglass. Offered in a large variety of sizes and speeds. Gravity or fresh air intakes available. Catalog illustrated with photographs and diagrams. Complete specifications.

Ammerman Co., Inc.

211—Extruded Aluminum Louvers

Bulletin KX-60 describes Penn extruded aluminum stationary louvers, adjustable louvers, packaged air inlets, single and multi-blade fire dampers, and *Pennhouses*. Data on material, finish, sizes, and screens given. Includes suggested specifications. Photographs illustrate models and drawings show operation.

Penn Ventilator Co., Inc.

212—*Paraflo* Space Heaters

Bulletin 580-13 describes the line of Dravo space heaters designed for use in the 200,000 to 500,000 Btu/hr range. Drawings and specifications on the four heaters are given. The *Paraflo* heater is used as a low-cost method of heating medium-sized industrial plants and commercial and institutional buildings.

Dravo Corp.

213—Air Handling Products

Bulletin B-5188S offers Westinghouse Sturtevant line of air handling products and electronic air cleaners. Apparatus listed for heating and ventilating, industrial processing, cooling and dehumidifying, and electronic air cleaning. All equipment is illustrated photographically.

Westinghouse Electric Corp., Sturtevant Division.

214—Multi-Zone Platecoil

Bulletin 159, 48 pages, completely describes new *Multi-Zone Platecoil*, covering styles, dimensions, specifications, and operational data. Methods of calculating heat transfer equipment requirements are outlined. Typical installations are pictured and described. Available on request.

Tranter Manufacturing Inc.

HEATING & VENTILATING EQUIPMENT *continued*

215—Space Heaters

Catalog 2659A illustrates and fully describes how to effectively space heat in buildings with high ceilings. Sixteen pages include technical data, mounting heights, spread circle diameters, unit capacities of 30 sizes, specifications, and dimensional drawings. Complete charts, tables, and graphs included.

Young Radiator Co.

216—Bifurcator Fans

Catalog DB-37-55, 16 pages, describes operation of the bifurcator fan, a split-housing fan that exhausts hot, corrosive, and flammable fumes. Use of the bulletin makes fan selection easy since it gives full data on fan laws and static pressure, velocity pressure, and friction.

DeBothezat Fans, Division of American Machine & Metals, Inc.

217—Heating-Ventilating Cabinets

Bulletin UH-130 gives complete description on heating and/or ventilating cabinets. Type HV is for both heating and ventilating in horizontal or vertical operation. Type V is for ventilating only. Information includes unit arrangements, physical data, weights, fan performance, dimensions, and coil ratings.

Buffalo Forge Co.

218—Induced Draft Fans

Bulletin L-3 describes Lehigh's line of centrifugal induced draft fans. Covers rating tables shown at 600°F, dimension data, and construction material specifications. Recommends sizes of fans for oil, gas or coal fired boilers. Includes typical installations and photographs.

Lehigh Fan & Blower Division Fuller Company.

219—Low-Level Roof Ventilators

Bulletin 609 covers new Aerovent *Sil-low-et* roof ventilators designed to provide the lateral-look for commercial and public buildings and industrial plant and office structures. Furnished in sizes 12" to 48" in belted and direct-connected models for capacities to 35,900 cfm at external resistances of ⅛" to ¼" SP.

Aerovent Fan Co., Inc.

220—Wall Louvers

Bulletin SPV-17B describes and pictures 39 standard sizes of adjustable wall louvers, fixed louvers, combinations of the two types, and automatic units. Louver operators, screens, installation and construction specifications are also covered. Special louvers to your specifications can be supplied promptly.

Burt Manufacturing Co.

221—Infra-Red Heating Album

Bulletin P-1-60 contains photos of over 20 *Panelbloc* installations showing the vast range of applications which can be covered by infra-red heating. Included are automobile agencies, gas service stations, retail stores, woodworking and machine shops, farms, and manufacturing plants. Description on each photo.

Bettcher Manufacturing Corp.

222—Direct Drive Ready Units

Bulletin 502 describes Clarage's new line of compact ready-to-run fan sets. For handling clean air at temperatures to 200°F, volumes from 100 to 7500 cfm, pressures to 2 in. Units and component parts are illustrated. Construction, available accessories, and special features. Capacities and dimensions included.

Clarage Fan Co.

223—Power Roof Ventilators

Bulletin 680-C describes *Sky-Blast* power roof ventilators. Weatherproof features include corrosion-proof, aluminum alloy propeller; nonclogging dampers and rain-shed; one-piece all welded base hot-dip galvanized after fabrication. Automatic fire-vent release. Sizes to 60 inches; air deliveries to 78,000 cfm.

Robbins & Myers, Inc.

224—Duc-D-fuser for Air Control

Bulletin DDF describes *Duct-D-fuser*, a new concept in air distribution. This is a compact, versatile, efficient, and economical method of controlling air distribution directly from the run of exposed duct. Four models are illustrated and described. Photographs show actual installations along with duct and fittings.

United Sheet Metal Co., Inc.

225—Industrial Fans

Heavy duty industrial IPL fans that range in capacity from 4000 cfm through 154,000 cfm with static pressures to 12" wg are described in Bulletin 572. Sturdy all-welded construction and easy maintenance features make these fans ideally suited to severe industrial air moving applications. Illustrated.

New York Blower Co.

226—Scotch-Type Packaged Boilers

Modern scotch-type 3-pass design gives these boilers certified efficiencies of over 80%. Flue gas temperatures in the 400° to 450° range, 20 to 800 hp, and new SBI 5 sq ft per hp fireside heating surface ratings. Designed for oil, gas, or oil/gas firing. Shipped in single units or boiler-burner packages.

Burham Corp., Steel Boiler Department

HEATING & VENTILATING EQUIPMENT *continued*

227—Applying Industrial Heaters

Bulletin IND-591 supplies all needed data to design industrial heating jobs using direct-fired heaters (with heat exchangers). It has definitions, heat loss calculations, nozzle and duct air distribution, single and multiple installations, door heating, process heating, make-up air controls, fuel piping, and usage.

Lennox Industries Inc.

228—Scotch-Type Packaged Boilers

Bulletin 149A describes the new line of Kewanee forced-draft scotch packaged units including models for high pressure; for gas, oil, or gas/oil firing. Outputs range from 82 to 691 boiler horsepower. Ratings, engineering data, dimensions, standard and optional equipment. Cutaways show boiler operation.

American-Standard Industrial Division.

HIGHWAY, BRIDGE & STREET MATERIALS

229—Steel Rope

This publicatoin contains information required for selection and preparation of specifications for wire, strand, and rope lustrations, descriptions, and engineering systems of all kinds, except major suspension bridges. Both standard and special fittings for use with bridge strand and bridge rope are illustrated.

John A. Roebling's Sons Division.

233—Steel Monotube Lighting Poles

Bulletin 29 presents new designs and data covering steel *Monotube* lighting poles for streets, highways, parking lots, shopping centers, and other locations. Poles are engineered for properly mounting today's modern luminaires. Similar information available in Bulletin LS-30 covering aluminum poles.

Union Metal Manufacturing Co.

230—Metal Grid Bridge Roadways

Irving decking catalog F-300 contains illustrations, descriptions and engineering data on open metal grid bridge roadways, with many of the advantages inherent in this type of bridge roadway, such as light weight, cleanliness, drainage, safety, durability, strength, traction, and economy.

Irving Subway Grating Co., Inc.

234—Railight Kit

Kit PW-371 contains complete information on illumination as an integral part of highway and bridge railing. Included is installation and engineering data on types available and on actual railight installations. Lupton 40 page Bridge Railing catalog also included in binder, file size for easy filing and reference.

Michael Flynn Mfg. Co.

231—Paving Parking Areas

Bulletin R 156-2 describes how to properly construct concrete pavements for parking areas. Includes pavement subgrade, quality of concrete, thickness of pavement slab, traffic, jointing of concrete pavement, and distributed steel. Contains tables, line drawings, and photographs show actual applications.

Portland Cement Association.

235—Traffic and Safety Equipment

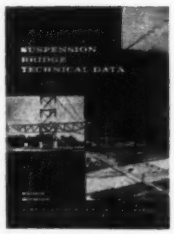
This illustrated brochure describes Planet's new line of highway traffic and safety equipment. Included are overhead sign trusses, roadside directional signs, bridge railings, and pedestrian overpasses. Planet's highway products are illustrated and described in text. Also make engineered systems and automation equipment.

Planet Corp.

232—Highway Lighting Standards

Kerrigan's new multi-page, indexed catalog contains engineering data on steel and aluminum lighting standards for streets, highways, and bridges. Catalog contains photographs and diagrams as well as complete specifications. Included in section on tests and charts and one listing modifications and accessories.

Kerrigan Iron Works, Inc.



236—Suspension Bridge Data

Catalog D-943 contains technical data making possible preliminary calculations for comparative estimates between the suspension bridge and any other contemplated type. Includes formulas for determining cable and suspender lengths, cable tensions, erection calculations, and catenary formulas.

John A. Roebling's Sons Division.

HIGHWAY, BRIDGE & STREET MATERIALS *continued*

237—Soil-Cement Base Course

Bulletin SCB 12-7, issued by Portland Cement Association, gives soil-cement information. Includes general information, materials, equipment, construction methods, measurements, and basis of payment. Construction methods include preparation, cement application, mixing, finishing, curing, and jointing.

Portland Cement Association.

238—Street Lighting Guide

Kerrigan's new "Bright City is a Safe City" is a guide to planning and promoting street lighting programs. Contains charts and tables on traffic volume, light intensities, pole spacing, mounting heights. Illustrates and describes relighting programs of specific communities. Completely illustrated.

Kerrigan Iron Works Co.

INDUSTRIAL PROCESSING EQUIPMENT

239—Dielectric Heaters

Booklet 15B6431 describes the operating advantages of dielectric heaters for a variety of functions such as drying, baking, heating, and curing of non-conducting materials. Various sizes and styles are described. A listing of all units gives electrical requirements. Btu output, and physical sizes and weights.

Allis-Chalmers.

243—Collating and Cartoning

Bulletin describes the Lynch *Morpac* Model "BK" machine designed to take individual items, accumulate them in various multiples within package limitations, place them in an economical wrap-around blank and seal all three flaps of the carton for complete pilfer-proof protection. Speeds to 40 cartons per min.

Lynch Corp.

240—Selection of Steam Traps

Bulletin T-10 short-cuts timely calculations in the selection of Yarway impulse steam traps for processing equipment. An alphabetical listing of equipment recommends specific traps or refers to one or more of the 15 tables with pertinent selection data. A 3-page foldout illustrates typical piping diagrams.

Yarnall-Waring Co.

244—Knittel Crusher

Bulletin 858 describes Knittel crusher with ring type double rotor. The literature features comprehensive technical and engineering data, specifications, diagrams, and illustrations. The unit offers an exclusive crushing action that increases capacity, crushes wet sticky material without danger of plugging.

Stephens-Adamson Mfg. Co.

241—Industrial Radiant Heaters

Bulletin PE-70 gives product data on both *Vycor* brand tubular heaters and *Pyrex* brand panel heaters. These are two types of industrial heaters for drying, baking, heating, and curing. Bulletin contains pictures of typical installations, exploded view of heaters, and installation illustrations. Specifications given.

Corning Glass Works.

245—Induction Stirrers

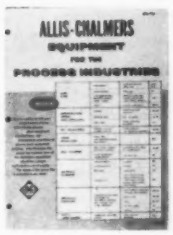
Bulletin 7703E describes how much the fitting of an induction stirrer to your arc furnace will help you to cut your furnace time in many ways and thereby increase production, lower your running costs, while improving the output of your furnace. A graphic illustration of the principles of induction stirring.

Asea Electric, Inc.

242—Precision Mechanical Seals

Both standard and custom engineered mechanical shaft seals are described in this 4-page bulletin for design engineers. Factors to be considered in designing mechanical seals into pumps, mixers and other equipment are given. Cutaways and photographs.

Borg-Warner Mechanical Seals Division of Borg-Warner Corp.



246—Process Industries Equipment

Bulletin 685-716 covers air and gas handling, pumps, valves, milling and screening equipment, and material handling equipment for the process industries. Also includes information on washing, car shaking, motors, and controls. All equipment is illustrated and described. Specifications and selection data.

Allis-Chalmers.

INDUSTRIAL PROCESSING EQUIPMENT *continued*

247—Compacting Process

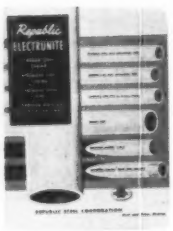
New bulletin 07B8836 describes this low-cost method of upgrading waste fines into usable particle sizes, a process finding many applications in the chemical process industries. The bulletin describes a new Allis-Chalmers compacting mill designed to provide a low-cost means for converting particle size.

Allis-Chalmers.

248—Process Equipment

Bulletin 100-B describes Hardinge's complete line of process equipment for mining, chemical, stone, ceramics, water, sewage, and industrial waste applications. Equipment described is for agitating and mixing, clarifying, wet and dry classifying, cooling, drying, filtering, feeding, grinding, sampling, and others.

Hardinge Co., Inc.



249—Tubing for Process Industries

Catalog CEC-60 covers carbon and stainless steel tubing, stainless steel pipe, and corrosion resistant electrical raceways for application in chemical and related industries. Method of processing, availability, and testing are discussed. Specifications information and corrosion data chart included.

Republic Steel, Steel and Tubes Division.

250—Bar Wrapping Machinery

Bulletin describes the Lynch *Morpac* Model "BW" machine designed for versatility and speed in wrapping candy bars, ice cream bars, and other products of uniform size in paper, foil, and laminates giving a neat, tight-wrapped package with optional heat seal. Capacity up to 150 bars per minute.

Lynch Corp.

251—Process Equipment Preheater

Brochure entitled "The Ljungstrom Air Pre-Heater for Process Equipment" describes the fuel economy possible with this regenerator. Table of comparative fuel and power costs and graph clearly show these economies. Explains how added furnace capacity gives increased production and higher quality.

Air Preheater Corp.

252—Sanitary Pumps

Catalog Section "F" describes new line of Viking *Sanitor* pumps for handling of all liquid and semi-liquid food products. Three sizes, eighteen models with capacities ranging from 17 to 90 gpm. Equipment "3A" approved for sanitary applications. Specifications, dimensions, performance curves, and engineering data.

Viking Pump Co.

253—Automatic Samplers

Bulletin 47-A describes Hardinge's redesigned automatic sampler. Details the new operating mechanism of the sampler and includes typical arrangements for both wet or dry processes. Illustrations show sampler and various components. Line drawings show operation. Keyed drawings give dimensions and parts.

Hardinge Co., Inc.

254—Grinding Mills

Consultants in rock products, chemical, and mining will find bulletin 07B6718 a handy reference manual. Construction and application of grinding mills are thoroughly covered. Many charts and tables provide useful technical data. A separate section, 07B9607, highlights a *Twinducer* which cuts drive space.

Allis-Chalmers.

INSTRUMENTS and CONTROLS

255—Remote Registering Systems

The Stevens *Telemark* System for remote registration of moving elements is described in Bulletin 22. Moving elements such as, liquid levels in streams, reservoirs, positions of gates or precipitation in a precipitation gage are coded into electrical pulses for transmission. Illustrated in line and photograph.

Leupold & Stevens Instruments, Inc.

256—Storage Tank Freeze Control

Catalog Section 4-B describes the new complete No-Freeze protection for outdoor water storage tanks. Lists advantages and explains principle of operation. Cutaway photograph of complete unit shows components. Submersible head containing the controls pictured. Switch mechanism illustrated.

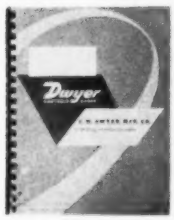
Magnetrol Inc.

INSTRUMENTS & CONTROLS *continued*

257—Pneumatic Control Systems

Bulletin M-101 explains the principles of pneumatic controls for heating, cooling, ventilating, air conditioning, and industrial processes. Controllers and controlled devices are shown in detail. Bulletin also covers typical applications ranging from simple thermostat-valve arrangements to complex dual-duct control systems.

Johnson Service Co.



258—Controls and Gages

The complete Gage and Control Catalog contains illustrations, prices and complete details on Dwyer *Magnehelic,* gages, manometers, air meters, air filter gages, pitot tubes, pressure actuated switches, flowmeters, combustion testing instruments. Diagrams, conversion curves, and other technical data.

F. W. Dwyer Mfg. Co.

259—Temperature Regulators

Bulletin J180-1 describes OPW-Jordon's sliding gate temperature regulators. Self operated, pilot operated, and combination temperature pressure regulators detailed. Features, application, operation, rating tables, dimensions, and weights included. Cutaways show construction. Construction materials listed.

OPW-Jordon Corp.

260—Boiler Water Columns

Catalog 500, "Boiler Water Columns and Gage Equipment", describes water columns, gages, valves, and other boiler safety devices available to the consulting engineer. New designs are completely described with photographs and cross sectional and mechanical drawings. Specifications, dimensions.

Reliance Gauge Column Co.

261—316 SS Pressure Controls

Bulletin 0-19 describes mercury switch equipped pressure controls incorporating 316 stainless steel bourdon tube with welded pressure connection. Outside adjustments, visible calibrated dial, visible on-off circuit position. Specifications and accessories for general purpose, weather-proof, explosion proof controls.

Mercoid Corp.

262—Armored Purge Meters

Catalog 510.200 describes complete range of armored purge meters. These dependable flow meters are built for rugged duty in high temperature and pressure use. Indicating tube is marked with both water/gph and percentage scales. Includes design, features, applications, selection tables, specifications.

Wallace & Tiernan Inc.

263—Vapor Tension Thermometers

Catalog 76-T describes the Marsh line of rigid stem and distant reading vapor tension thermometers furnishing fahrenheit and centigrade ranges. Illustrates the wide selection of case patterns and standard dials available. All data necessary for accurate specfications. Also covers piping and duct thermometers.

Marsh Instrument Co.

264—Automatic Safety Controls

Bulletin FS-1 describes a dependable, moderately priced type of automatic control of safety device that makes or breaks electrical circuit when flow in a pipe starts or stops. Shows wide variety of uses – controlling signal devices, alarms, motors, burners, metering devices. Details typical use in air conditioning.

McDonnell & Miller, Inc.

265—Specifying Guide for Tank Gages

Form 632 is a specification guide especially designed in handy folder form to assist consulting engineers to specify their choice of tank contents gaging systems for each project. Contains sample specifications for hydraulic system, and hydrostatic systems (manually operated and continuous reading).

Liquidometer Corp.

266—Portable Holiday Detectors

Bulletin EP describes Tinker and Rasor's portable damp-climate, pulse-type, holiday detector for surfaces coated or wrapped with high electrical resistance material. Adoptable for use on both large and small diameter pipe as well as flat surfaces. Bulletin furnishes specifications, voltage range, components.

Tinker and Rasor.

267—Manometers for Plant and Lab

Catalog 2008 covers U-type, single- and multi-tube well-type, and inclined-tube *Manometers,* for measuring pressure vacuum, flow; draft gauges; indicating liquids; accessories. Explains operating principle and inherent accuracy. Discusses points to consider in selecting *Manometers* for specific applications.

King Engineering Corp.

268—Centralized Control Systems

Bulletin 106 describes Panellit's design approach, materials, construction, and modern facilities used in manufacturing a variety of centralized control and data presentation systems. Various types of panels to suit every requirement are illustrated. Close-up photographs of actual installations show craftsmanship.

Panellit, A Division of ISI, Inc.

INSTRUMENTS & CONTROLS *continued*

269—Monitoring Systems

Bulletin 1058 describes *Scammit* monitoring systems employing completely self-contained static switching components to eliminate component failure. Describes long system life, low initial cost, easy installation, and freedom of maintenance. Illustrates basic models and gives applications. Dimensions.

Scam Instrument Corp.

270—Thermostatic Water Controls

Powers hospital catalog features a complete line of thermostatic water control equipment for therapeutic and other needs. Includes data dimensions and installation drawings. Designed for use in preparing plumbing plans and specifications. Can be used in conjunction with plumbing manufacturers catalogs.

Powers Regulator Co.

271—Resistance Temperature Detector

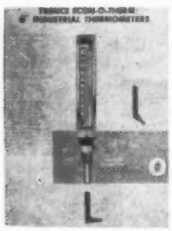
Bulletin 3047 describes the Edison resistance temperature detectors – stable, accurate, fast, sensitive, and rugged. Comparisons are made between the old type detectors and the new. Reliable temperature measurement is vital to modern industry. Operating principle, history, and advantages are included.

Thomas A. Edison Industries.

272—Automatic Metering System

Bulletin FL-56 describes Hetherington & Berner's *Fluidometer*, an automatic batch metering system. Adoptable to practically any liquid measuring problem. Equally accurate with high or low viscosities, eliminating waste. Shown in photo and diagram are direct control, remote control, dual valve, and multi-valve systems.

Hetherington & Berner Inc.



273—Low Cost Thermometers

Bulletin 3100M describes a complete new line of thermometers, both mercury and dial indicating. Each thermometer offered is illustrated. Specifications and prices are charted. Panel drilling dimensions, standard ranges, and complete ordering information included. Sales offices in Canada and United States listed.

H. O. Trerice Co.

274—Electrical Controls

Engineering reference catalog 18A contains a complete line of standard Zenith electric controls and timing devices. Photos, diagrams, engineering data, and prices on automatic transfer switches, magnetic contactors, remote control switches, program clocks, automatic reset timers, cycle timers, and special controls.

Zenith Electric Co.

275—Bi-Color Boiler Gauges

Bulletin 2044-A describes *"Multi-Port"* bi-color gauge MP 1050 for boilers operating at pressures up to 1050 psig. Water always shows green and steam red. Vision slot divided into series of round ports. This permits use of small glasses and small mica which are stronger and less sensitive to thermal stress.

Diamond Power Specialty Corp.

276—Liquid Level Controls

Bulletin F-4A describes Fisher displacement type pneumatic proportional and two-position liquid level controllers in iron, steel, or alloy constructions for pressures up to 2500 psi. Models also available for specific gravity and interface level control applications and as indicators and transmitters.

Fisher Governor Co.

277—Check-Weighing Systems

Bulletin 50 covers high-accuracy systems (±0.25% scale range) for verifying package weight of single- or multi-unit, dry or liquid containers. Operation may be manual or automatic. Includes information on indicating, recording, and totalizing instrumentation for production, inventory, and accounting purposes.

Weighing & Controls, Inc.

278—Control Panels

Bulletin G-9 describes modern graphic panels for automatic handling of dry materials and process equipment control. Panels are designed and fabricated by manufacturer and are internally wired. Wiring diagram is furnished and supervision is normally furnished for start-up of system. Illustrated.

Fuller Co.

279—Portable Hydronion Meters

New bulletin describes portable *Hydronion* meters manufactured by Carma Manufacturing Co. Designed to conveniently measure specific conductance of a solution in locations where electric power is not available. Gives ranges, increments, reading selector, and pertinent applications. Illustrated.

Carma Manufacturing Co.

280—Water Control Equipment

Bulletin 315 illustrates, and provides specifications for, the complete line of Sparling propeller-type main-line meters, recording instruments, and control equipment. Various applications, flow ranges, sizes, cut-away drawings, and installation information are all included. Pictured are production and test equipment.

Hersey-Sparling Meter Co.

INSTRUMENTS & CONTROLS *continued*

281—Control Guide for Engineers

Barber-Colman Company of Rockford, Illinois, has published an Automatic Control Systems Guide, F-8944, for consulting engineers. The guide discusses *Electronic* control systems and a selection guide for designing various types of automatic systems for air conditioning, heating, and ventilating.

Barber-Colman Co.

To order personal copies of these bulletins, please fill out the card between pages 2 and 3 or 58 and 59.

282—Pneumatic Control Centers

Bulletin S-103 describes the functions, applications, and operation of centralized pneumatic controls for air conditioning, heating, and ventilating systems. The advantages of using pneumatic transmission are explained and the latest developments in control center instrumentation are shown in this 12-page booklet.

Johnson Service Co.

283—Air Filter Gages

Bulletin C-1 presents the standard Dwyer line of filter gages. The Consulting Engineer's specification data is included for each of the three standard types of gages. These gages provide a continuous check on the efficiency of all types of filters. Various types are illustrated. Sales representatives are listed.

F. W. Dwyer Mfg. Co.

284—Fuel Cut-Out Control

Bulletin D2.5 describes a new device providing single or dual fuel cut-out control and low water level alarm if desired, is the *Levalarm* EA-100P. Cut-out can be controlled by a float-operated function or by an electrode set-up, or both may be used where dual cut-out facilities are prescribed.

Reliance Gauge Column Co.

285—Pneumatic Controller for Pumps

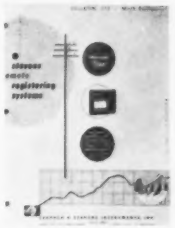
Catalog 420.690 shows features and operation of pneumatic controller for W&T run-adjust metering pumps, illustrates typical applications. Controller is easly mounted, adjusts pump's stroke length in response to external air signal. With this controller, manual pumps may be adapted to automatic control.

Wallace & Tiernan Inc.

286—AC Controlled Speed Systems

Bulletin F-1963 tells about U. S. *Varidyne* ac system for controlling the speeds of standard ac fixed-speed motors within a range of 5:1. *Varidyne* power unit varies motor speeds making any ac motor into an adjustable-speed motor. Various types of applications are illustrated with drawings and photographs.

U. S. Electrical Motors Inc.



287—Remote Registering System

The Stevens Impulse System for remote registration of moving elements is described in the Ninth Edition of Bulletin C15. Components of this system including various types of receiver indicators and recorders are illustrated and described. Applications data for remote registration of water levels or flow.

Leupold & Stevens Instruments, Inc.

288—Boiler Water Level Controls

Catalog Section 3 covers single and multi-stage Magnetrols for pressures from 30 to 1668 lbs. WSP. Includes engineering data, many cut-away views, installation sketches, and dimensions. Fully describes and illustrates safety features, infinite-life magnetic principle, flexible switching action, model range.

Magnetrol, Inc.

289—Sliding Gate Pressure Regulators

Bulletin J160-1 describes the full line of sliding gate pressure regulators. Available in self-operated, pilot-operated, solenoid-operated, and back pressure models. Sizes ¼" through 6", patented sliding gate seats give tight shut-off, end wire drawing, and cut maintenance. Catalog gives features and engineering data.

OPW-Jordan Corp.

290—Instrument Air Pressure Control

Bulletin 02 describes Mercoid's new pressure control, small in size and light in weight. Specifically designed for instrument air. Outside adjustment, calibrated dial and hermetically sealed contact. Operating ranges 1 to 20 and 1 to 30 psi. Cutaway shows construction. Wiring circuit and dimensions.

Mercoid Corp.

291—Complete Line of Gauges

Catalog 76-G contains descriptive information on the broad Marsh line of gauges. Evaluates exclusive Marsh features; illustrates choice of easy reading dials and case patterns. Cites standard gauges for specific applications. Also covers solenoid and needle valves often used on applications requiring gauges.

Marsh Instrument Co.

INSTRUMENTS & CONTROLS *continued*

292—Annunciator Nameplates

Bulletin sheet describes new *Magna-Plac* nameplate now available as a no-charge option on Scam *De-Line* annunciators. New, larger nameplate provides 70% more engraving area; 50% more characters per nameplate, without increasing overall size of annunciator. For fully descriptive, visible trouble legends.

Scam Instrument Corp.

295—Tank Contents Gaging Systems

Suggested specifications for tank contents gaging systems – hydraulic, hydrostatic, and direct reading – are given in bulletin 463A. Model selection guides and pictorial diagrams are included, along with a list of liquids successfully gaged by Liquidometer systems, and principles of operation of each gage.

Liquidometer Corp.

293—Safety Controls Data

Engineering data on operating and safety controls for a wide variety of jobs involving liquid level or liquid flow. Discusses 21 case studies of special applications of McDonnell float-operated switches and valves, and flow switches. Designed to suggest a dependable, economical answer to control problems.

McDonnell & Miller, Inc.

296—Portable Detectors

Bulletin M1 describes Tinker and Rasor's portable detector for locating bare spots in thin protective films. Widely accepted in the corrosion control and industrial painting industry. It is nondestructive, applied voltage never exceeds 67½ volts. Bulletin furnishes specifications, operating data, and prices.

Tinker and Rasor.

294—Industrial Liquid Level Gages

King-Gage Catalog 1010 gives details and specifications of hydrostatic gauges for measuring depth, volume, or weight of almost any liquid in any tank or processing vessel, under pressure or vacuum, from any desired location. Describes operation; shows applications in many industries; gives installation data.

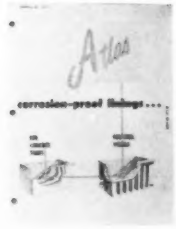
King Engineering Corp.

297—Interlock and Shutdown System

Bulletin 105 illustrates and describes *Panalarm* Interlock and Shutdown system. This control system permits centralized regulation of each phase of the operation. Isolates and prevents the spread of trouble in complex inter-dependent operations. Typical operational sequence charted. Dimensions included.

Panellit, A Division of ISI, Inc.

INSULATION & PROTECTIVE COATINGS



298—Corrosion Proof Linings

Bulletin 4-2 discusses Atlas corrosion-proof tank linings for steel and concrete vessels. Cross-sectional drawing shows application of Atlas linings. Complete resistant chart includes such materials as chemicals, alkalies, salts, gases, organic materials, and industrial solutions. Actual installation shown.

Atlas Mineral Products Co.

300—Pipe Protection Tape

Bulletin introduces Tapecoat 20, an improved, hot-applied, pliable coal-tar coating in tape form, gauged for thickness. Includes polyester film outer wrapper. Designed for single-thickness application with minimum overlap. Easy to apply on pipe, joints and fittings, conduit, cable, insulated pipe, tie rods.

Tapecoat Co.

299—Gilsulate Applications

Illustrated booklet S-88 gives the complete story of *Gilsulate;* what it is, what it does, how it's used, and who uses it. Booklet explains installation procedures and insulating values. Also tells of the organization in back of *Gilsulate*—checking of piping layouts and soil conditions and supervision of actual installations.

American Gilsonite Co.

301—Asbestos Insulation

Engineering manual F76-321 gives detailed information on Union Asbestos & Rubber Company's *Unibestos* pipe insulation. Precision production methods and rigid quality control described and pictured. Important advantages, installation photographs, comparison charts, application methods, and technical data.

Union Asbestos & Rubber Co.

INSULATION & PROTECTIVE COATINGS *continued*

302—Coatings and Weather Protection

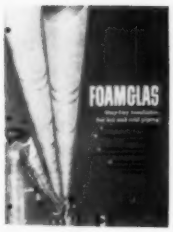
Bulletins M and MRC describe Foster's mastic coatings applied for weather protection of water absorptive materials for thermal insulation. The latter bulletin is a mastics reference chart including such data as description, coverage, drying time, service temperature, flash point, clean-up solvent, and other data.

Benjamin Foster Co.

303—Long Textile Insulation

Revised catalog ULD describes the use of *Ultralite*, the long textile type insulation for duct wrap and duct liner. Characteristics of *Ultralite* duct liner, together with application methods, are listed. Facings available, including new gray fire resistant coating, shipping information, and specifications are given.

Gustin-Bacon Manufacturing Co.



304—*Foamglas* Pipe Insulation

Bulletin FI-108 describes *Foamglas Stay-Dry* insulation for hot and cold piping with fire retardant jacket. Ability to retard fire, water, dimensional stability and strength illustrated by photographs and case histories. Technical data on suggested thicknesses for varied applications, sizes, thicknesses, specifications.

Pittsburgh Corning Corp.

305—Neoprene Coatings

Bulletin 7-N discusses Atlas Neoprene coatings. Explains how to choose the proper Neoprene coating for the proper application. Resistance chart shows the effect of various chemicals, both organic and inorganic, upon Neoprene protective coatings. These protective coatings are the result of over 16 years of pioneering.

Atlas Mineral Products Co.

306—Polyurethane Insulation

Data sheet describes the new low temperature insulation for the temperature range of minus 300° to plus 225°F. A 85% closed cell product weighing approximately 2.3 lbs per cu ft with ak factor of .15 at 70° ambient. Lightweight, rugged, easy to apply. Can be vapor-proofed with standard materials.

Union Asbestos & Rubber Co.

307—Coal-Tar Protective Tape

Hot coal tar protection in easy-to-apply tape form for pipe, pipe fittings and joints, conduit, cable, insulated pipe, tie rods. Material is heated lightly to soften the pitch, then spirally wrapped onto pipe surface. Tapecoat provides long-life protection equivalent to a hot-applied coal-tar pipeline coating.

Tapecoat Co.

308—Permalex Insulation

Colorful brochure GEA-7047 describes the advantages of General Electric's *Permalex* insulation. You get 12 percent larger transformer with the same operating life and same investment. Advantages of using this insulation in pole-type distribution, large distribution, and network transformers is outlined.

General Electric Co.

309—Wire and Cable Insulation

This illustrated 6-page manual 9-114 describes *Silastic*® wire and cable insulation for reliable service under the most severe operating and environmental conditions. Outstanding properties include resistance to temperature extremes and variations from -90 to 260° c. Photographs show installations and details.

Dow Corning Corp.

310—Butyl Rubber

Twelve-page, two-color bulletin describes in detail Butyl rubber. Many applications of this rubber that stays "alive" are pictured. Many comparison graphs show effect of heat aging, electrical stability, shock absorption, sound damping, tear resistance, abrasion loss, gas permeability, and low temperature flexibility.

Enjay Co., Inc.

311—Pipe Insulation News

News magazine, published by the manufacturer of Gilsulate insulation for underground hot pipes, carries stories and articles on actual installations. This issue describes use of Gilsulate by Caterpillar Tractor Co., gives a report on Gilsulate efficiency, and instructions for tamping the Gilsulate bed. Illustrated.

American Gilsonite Co.

312—Snap-On Pipe Insulation

"G-B Snap-On Pipe Insulation," eight-page booklet, describes characteristics and application data for one piece, fine-glass pipe insulation. Application specifications cover plumbing, heating, insulation of valves and fittings, cold piping, dual temperature, and outdoor piping. Thickness charts are also included.

Gustin-Bacon Manufacturing Co.

313—Surface Coatings and Sealers

Bulletins C and CRC describe Foster's decorative protective coatings used to protect insulation from weather, physical abuse, and other damaging factors. The latter bulletin is a Coatings Reference Chart including such data as coverage, drying time, service temperature limits, and other pertinent information.

Benjamin Foster Co.

LIGHTING FIXTURES & ACCESSORIES

314—Louver Diffusers

Folder 6 describes the *Mystic Gratelite* louver diffuser. When installed in fixtures or overall ceilings, *Mystic Gratelite* changes from an open louver diffuser to a solid-appearing luminous panel—depending on your point of view. Folder shows complete line of Guth fluorescent fixtures and *Gratelite* overall ceilings.

Edwin F. Guth Co.

315—Suspension Fluorescent Fixtures

Descriptive folder V-820 features Sylvania's newest suspension fluorescent lighting fixture. Together with appropriate catalog pages, information is provided which emphasizes the graceful styling which is the keynote of this line. Fixtures are illustrated as are the plastic panel and plastic louver shielding.

Sylvania Electric Products Inc.

316—Outdoor Luminaire Maintenance

Safety and cost-saving features, typical installations, operating procedures, and available models of Thompson *Servisafe* pole and bracket units are covered in Bulletin PWB-59. *Servisafe* products permit fast hazard-free ground-level luminaire servicing by one man to assure low-cost year-round lighting efficiency.

Thompson Electric Co.

317—Shallow Fluorescent Fixtures

Catalog 32, "Surface and Pendant Corona", describes new shallow fluorescent unit which combines walnut and birch frame with expansive luminous styrene panel. Many sizes, distinctive appearance. For use wherever handsome lighting is called for—offices, residences, board rooms, reception areas.

Lightolier Incorporated.

318—Compact Exit Signs

Folio 60-2 introduces the newest, most compact, code regulated illuminated directionals. "50 line" EXITS by mcPhilben are all cast aluminum, glass or stencil face, incandescent or fluorescent. Wall, ceiling extending bracket, recessed or pendant series available. Contains specifications and engineering data.

mcPhilben Lighting Inc.

319—Pre-Assembled Ceiling Fixtures

Specification Sheet 14 describes the Wakefield Twenty, a quickly installed, pre-assembled, luminous ceiling unit. Dimensional drawing and photograph of the unit shown along with line illustrations of various types of diffusers. Drawings for installation purposes and specifications are included.

Wakefield Co.

320—Fluorescent Ballast Distributors

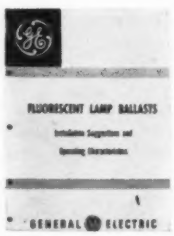
A revised list of electrical wholesalers who stock Advance fluorescent lamp ballasts is available in Bulletin 1201, Revised. Wholesalers listed stock popular Advance ballasts and will replace inoperative in-warranty Advance ballasts free of charge. The warranty policy of the company is explained.

Advance Transformer Co.

321—Lighting Specifications Book

RLM standard specifications book (1960) for industrial lighting units includes three new specifications for 1500 ma-units; D-4 fluorescent semi-direct medium high mounting, SD-3AL semi-direct aluminum, and SD-3PE semi-direct porcelain enamel units. Also many upward revisions of other existing specifications.

RLM Standards Institute.



322—Fluorescent Lamp Ballasts

Bulletin GET-922K gives installation suggestions and operating characteristics for GE fluorescent lamp ballasts. Contains chapters on starters, various types of ballasts, and equipment for dc operation. Photographs, line drawings, and wiring diagrams are used to amplify the text. Service and sales locations listed.

General Electric Co.

323—Lighting for Public Buildings

Bulletin 239P describes Kirlin built-in lighting for auditoriums, restaurants, and other areas of public buildings, as well as weather-proof fixtures for exterior marquees. Profusely illustrated. Details of fixtures used in the areas illustrated are given. Also data on exit lights of aluminum construction.

Kirlin Co.

324—"Quartzlite 500" Lamps

Bulletin QL-560 describes in full Appleton's all new "Quartzlite 500". The brochure gives information on application, features, photometric data, and accessories. This is the first successful lighting unit ever developed for use with the Quartzline lamp. Gives user exceptional control and high efficiency.

Appleton Electric Co.

325—Shallow Line Troffers

Bulletin A is the most complete specification catalog ever offered on recessed troffer lighting. This new 4-¾" deep troffer embodies features unequaled in the lighting field. A complete description of all these features is included together with complete ceiling drawings, illumination data, and technical specifications.

Benjamin Div., Thomas Industries Inc.

LIGHTING FIXTURES & ACCESSORIES *continued*

326—Fluorescent Lighting Ballasts

This bi-monthly newsletter covers advances in ballasts for fluorescent lighting and the activities of the Certified Ballast Manufacturers Association. It reports the latest news of industry's progress in improving fluorescent lighting performance standards. Sent free to consulting engineers on request.

Certified Ballast Manufacturers Assn.

327—Fluorescent Luminaires

Bulletin 61-150-7 gives a full description of the *Mainliner* fluorescent luminaire. This line offers seven different modular sizes with shieldings of different diffusers, lens, and louvers. Bulletin is illustrated with photographs and dimensional drawings. Detailed installation and application information.

Westinghouse Electric Corp.

To order personal copies of these bulletins, please fill out the card between pages 2 and 3 or 58 and 59.

328—*Plexiglas* Diffusers and Lenses

Bulletin PL-399 covers use of *Plexiglas* acrylic plastic for diffusers and lenses in lighting equipment. Lists grades, properties, colors, sizes. Includes light-transmittance and UV-transmittance graphs, spectrophotometric curves, design and installation details, distribution curves and coefficients of utiliziation data.

Rohm & Haas Co.

329—Slimlux Surface Modules

Five colorful specification sheets describe the new line of Guth *Slimlux* surface module fluorescent fixtures. Units available with four different side panels. Broad selection of bottom enclosures. Eight sizes. Each sheet contains lighting data, photographs, construction details, and engineering information.

Edwin F. Guth Co.

330—Industrial Fixtures

Complete catalog page V-315 covering line of industrial fixtures for 1500 ma T-12 or T-17 very high output lamps. The line includes a unit which complies with the new RLM No. D-4 specification, Engineering data, drawings giving detailed dimensions, photometric data, and application details are provided.

Sylvania Electric Products Inc.

331—Industrial Fluorescent Lighting

Bulletin F describes the newly designed and expanded line of industrial fluorescent lighting fixtures offered by the Benjamin Division of Thomas Industries Inc. Catalog includes detailed illustrations and complete specifications covering all elements of the line. The many features of this new line are explained.

Thomas Industries Inc., Benjamin Div.

332—Indoor Luminaire Maintenance

Safe low-cost floor-level servicing of high-bay luminaires is described and illustrated in Bulletin TH-57. The five basic requirements for a Thompson hanger installation, available hanger models, accessories, Underwriters' ratings, and range of applications also are outlined in detail. Illustrated.

Thompson Electric Co.

333—Fluorescent Lamp Ballast

Bulletin B-1000, superseding B570-10, gives data and prices of Jefferson's fluorescent lamp ballasts. Included are wiring diagrams and complete specifications on rapid start ballasts of 60 cycle, normal power, and high power. Sound control chart helps you make the proper selection of lamp ballast.

Jefferson Electric Co.

334—Incandescent Fixtures

Lightolier's new portfolio catalog 60 contains over a hundred imaginative designs in a wide range of styles from traditional to contemporary. Included are versatile new fixtures whose light output can change to match the varying mood and function of an interior. Top quality lighting for any decor.

Lightolier Inc.

335—Cast Aluminum Lighting Units

Folio 60-1, a 12 page booklet, describes mcPhilben's unique line of cast aluminum special purpose lighting units. Applications for vaportight, exterior, general interior use and directional signs. Includes specifications, drawings, and optional features to assist you in selection of quality lighting.

mcPhilben Lighting, Inc.

336—Hinged and Framed Troffers

Specification Sheet 30 describes the hinged and framed troffer manufactured by the Wakefield Company. Photograph illustrates actual troffer and line drawing gives specific dimensions. ETL photometric report included. Line drawings show units to fit various ceiling constructions. Gives specifying points.

Wakefield Co.

LIGHTING FIXTURES & ACCESSORIES *continued*

337—Fluorescent Lamp Ballast Guide

Bulletin ATC-110 is a new fluorescent lamp ballast buyer's guide, listing the newest models. Included is electrical data, physical dimensions, and packaging of popular 60 cycle ballasts. All information is in tabular form for easy reference. Also includes conditions of sale and other pertinent information.

Advance Transformer Co.

338—Lighting for Schools

Bulletin 235S describes Kirlin's built-in school lighting for auditoriums, gyms, class rooms, and exterior locations. The effect with a variety of lens, both fluorescent and incandescent, is shown. The bulletin is fully illustrated showing all types of installations. Details on fixtures and lamps including exit lights.

Kirlin Co.

339—RLM Label and Program

An answer guide to RLM labeled industrial lighting equipment has just been published for use of buyers and specifiers by the RLM Standards Institute. Pamphlet answers the most popularly asked questions concerning the RLM label and the RLM program. Reviews factors related to selection of lighting equipment.

RLM Standards Institute.

340—Ballast Application Guide Book

Loose-leaf guide book GIZ-964 reviews the leading principles of ballast specification. Lists, by application, recommended ballast-lamp combinations with performance characteristics of appropriate General Electric ballasts. Gives prices, ratings, and general information. You will be billed $5, including future revisions.

General Electric Co.

MATERIALS HANDLING & STORAGE FACILITIES

341—Vacuum Handling Systems

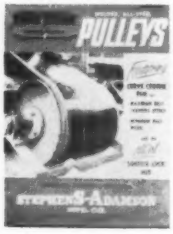
Six-page, two-color bulletin V-100 describes Whiting *Pressuregrip* vacuum handling systems, newest contribution to efficient materials handling. Closed vacuum system quickly and safely handles a great variety of products, cuts costs. Gives specifications and suggests a few of the many possible applications.

Whiting Corp.

344—Escalators

Brochure 660 describes new line of Haughton escalators. Lists available sizes and corresponding capacities, with arrangement suggestions. Includes typical layout with minimum required dimensions. Pictures typical Haughton escalator applications. Factory branches listed.

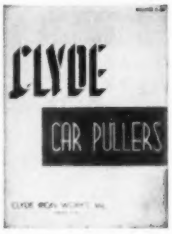
Haughton Elevtator Co.,
Div. of Toledo Scale Corp.



342—Curve Crown Pulleys

Bulletin 558 describes *Curve-Crown* welded, all-steel pulleys. The literature features comprehensive technical and engineering data, specifications, diagrams, and illustrations on the S-A *Curve-Crown* welded, all-steel pulley. This revolutionary design offers maximum belt training effect and minimum belt wear.

Stephens-Adamson Mfg. Co.



345—Car Pullers

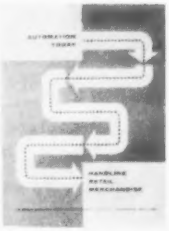
Ten-page bulletin L-6 shows capstan type car puller for moving cars a short distance using manila rope. Three styles of drum car pullers for heavy duty car moving, shuttle work, or for servicing very large areas are also listed, as well as barge movers for shifting barges back and forth during unloading.

Clyde Iron Works, Inc.

343—Crane and Hoist Electrification

Bulletin 76 tells why steel-enclosed Feedrail 60/90, 100/150, 225, 375 and 500 ampere crane and hoist electrification systems are specified. Advantages in design, in safety, in erection, and in performance are outlined. Includes photographs of typical installations and equipment descriptions.

Feedrail Corp.

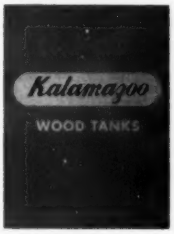


346—Handling Retail Merchandise

Reprint of article from Automation magazine entitled "Handling Retail Merchandise". This is a case history of how a downtown St. Louis department store solved their merchandise handling problems through the use of Columbus McKinnon equipment. With text there is a schematic of system and photographs.

Columbus McKinnon Chain Corp.

MATERIALS HANDLING & STORAGE FACILITIES *continued*



347—Wood Tanks

Eight-page bulletin 655-W explains why wood tanks can meet conditions other types of tanks cannot. It describes round, rectangular, and special tanks, as well as vats, boxes, sinks, and flumes. Lists possible uses for each along with the type of hardware and lining available, and gives installation photographs.

Kalamazoo Tank & Silo Co.

348—Pneumatic Vibrators

Catalog 109 describes the complete line of Cleveland air and electrically operated vibrators. Available in a full range of types and sizes capable of shaking anything. Completely illustrated with pictures of each type of vibrator, cutaways, and vibrators in use. Complete specifications with engineering data sheet.

Cleveland Vibrator Co.

349—Conveyors and Elevators

Bulletin 358 describes Redler *En Masse* conveyor and elevators. Features comprehensive technical and engineering data, specifications, diagrams, and application photographs. Redler conveyor elevators can be applied horizontally, around bends, on inclines, and vertically to convey pulverized, granular, small lump, and flaked.

Stephens-Adamson Mfg. Co.

350—Moving Sidewalks and Ramps

Bulletin 457 describes *Speedwalk* and *Speedramp* passenger conveyor systems from Stephens-Adamson. The literature presents comprehensive technical data, specifications, and illustrations of belt support and balustrade types. Also handrail and balustrade details, dimensions, and installation of moving sidewalks.

Stephens-Adamson Mfg. Co.

351—Automatic Conveyor Scales

Bulletin 858 describes the new Merrick Type SV *Weightometer* and its uses for automatic continuous in-transit weighing of bulk materials over an existing belt conveyor. Specifications and drawings of typical conveyor arrangements are shown, including diagrams showing how the new unit can be mounted.

Merrick Scale Manufacturing Co.

352—Derricks for Every Purpose

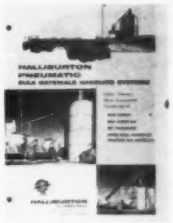
Catalog 200-D-4 describes American Steel derricks for handling heavy materials. Guy, stiffleg, steel erector, barge mounted, and special derricks with capacities from 2½ to 250 tons are shown. Contains construction details, complete specifications, and graph showing range of operation. On-the-job photographs.

American Hoist & Derrick Co.

353—Materials Handling Equipment

Sixteen-page, two-color bulletin 246 offers a definitive look at all Whiting materials handling equipment – overhead cranes, *Tranbeam* and *Pressuregrip* handling systems, and *Trackmobiles.* Fully illustrated booklet describes many outstanding design features of each product and shows how each is being used.

Whiting Corp.



354—Pneumatic Materials Handling

Brochure SP-11001 describes and illustrates Halliburton pneumatic bulk materials handling systems for loading, conveying, transporting, and unloading powdered, granular, and most pelletized dry materials. Installations to date have handled products varying in density from 16 lbs to 168 lbs per cu ft.

Halliburton Co.

355—Tile Tanks and Linings

Bulletin A-160 outlines scope of complete engineering, installation, and maintenance service on tile-faced reinforced concrete tanks, chests, vats, silos, and others. Also includes a wide range of ceramic and membrane linings for resistance against corrosion and abrasion. Various types of tanks are illustrated.

Stebbins Engineering & Mfg. Co.

356—Loading and Unloading Docks

Bulletin 450-15 points out that adequate dock facilities are an important materials handling tool. Lists companies served by Dravo-built docks. Installations of coal, ore, limestone, bulk materials, liquid cargo, steel, and multi-cargo docks are illustrated and described. Line drawings show typical layouts.

Dravo Corp.

357—Industrial Bulk Storage Tanks

Catalog 1839 features installation photos, specifications, and storage characteristics of Butler round, square, coated, and *Bulk-O-Matic* tanks for dry bulk commodities. A wide variety of bulk products being stored in Butler tanks include plastic pellets, sugar, roofing, granules, coal, and others.

Butler Manufacturing Co.

358—Coal Storage Methods

Six-page pamphlet describing how coal may be stored in large and small quantities for any length of time, indoors and out, with safety and at little cost. Equipment needed for outdoor storage; typical storage needs of various sized plants; and effects on coal of improper storage are also described.

National Coal Association.

MATERIALS HANDLING & STORAGE FACILITIES *continued*

359—Constant-Feed Weigh Systems

Bulletin 40 covers systems for continuously maintaining uniform flow rates of solids or liquids used in processing and formulating bulk materials. Details the use of unitized components to reduce development costs of job-engineered systems. Includes section on control instrumentation. Includes photographs.

Weighing & Controls, Inc.

360—Industrial Storage Systems

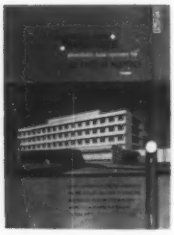
Catalog 9129 gives construction details, sizes and capacities of Marietta industrial silos. Line drawings show construction details and photographs show installations. Complete information on Marietta's construction service. Shows the four types of concrete staves offered.

Marietta Concrete Division
American-Marietta Co.

361—Automatic Handling Systems

Catalog 67-A describes, illustrates (photographs and diagrams) engineered and automated handling systems. The 16-page "Plan with Planet" brochure also illustrates equipment for bulk and unit materials, automated and special handling machinery, and foundry equipment. Describes Planet's creative service.

Planet Corp.



362—Transitubes for Hospitals

Bulletin E 21 describes pneumatic tube systems specially designed by The Grover Company for all types of hospitals. Systems range from small two-station directly connected types to the latest automatic installations linking a hundred or more stations. Illustrated.

Grover Co., Subsidiary of the
Powers Regulator Co.

363—Feedrail Conveyor Systems

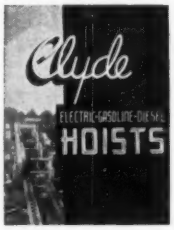
New catalog for consulting engineers Bulletin 60 describes 60 ampere Feedrail. This system is made up of standardized units, factory assembled for easy installation. Advantages are outlined. Design and construction are shown in cutaway photographs. All products, including accessories, are illustrated. Typical layouts and installation procedures.

Feedrail Corp.

364—Elevator Systems

Catalog SW-1 describes the complete line of Haughton Elevators, with special detailed information given on Haughton "*Auto-Signamatic*" systems for complete automation of multiple-unit elevator groups. Includes recommended sizes and dimensions for passenger, freight, hospital elevators, and dumbwaiters.

Haughton Elevator Co.



365—Power Hoists

Bulletin 34A, 20 pages, describes the Clyde line of electric, gasoline, and diesel hoists. Gives construction details of medium capacity hoists of various line pulls. Also includes information as to selecting the hoist, information required for hoist quotation, and table of drum cable capacities. Available accessories are listed.

Clyde Iron Works, Inc.

366—Power and Free Conveyors

Bulletin 159 describes Columbus McKinnon's *Power-Flex*, the power and free conveyor system. Applications include storage banks, manufacturing work stations, and many others. Construction and operating features of rail, chain, and trolleys shown in photographs. Typical conveyor system diagramed.

Columbus McKinnon Chain Corp.

367—Vitrified Glazed Tile Tanks

Kalamazoo vitrified glazed tile tanks and chests are described in four-page bulletin I-55-T. Drawings and photos show how the two types of tile blocks available provide flexibility of wall design. Types, sizes, design, erection, and cost are discussed, and typical installations in industry are pictured.

Kalamazoo Tank & Silo Co.

368—Air-Powered Vibrating Feeders

Bulletin 1000 describes Cleveland's air-powered vibrating feeders designed to move with air and control the flow. Various types of feeders are illustrated. Sheet for outlining your requirements for proper feeder selection is enclosed. Bulletin outlines the many advantages of Cleveland feeders.

Cleveland Vibrating Co.

369—Gantry Cranes

This four-page booklet, bulletin 93, demonstrates how a gantry crane designed by Whiting for Bliss & Laughlin has increased furnace capacity 20%. It describes how four heat treating furnaces are loaded and unloaded in a fraction of the former time and points out handling and maintenance savings.

Whiting Corp.

370—Constant Weight Feeders

Where accuracy in feeding, proportioning, and blending of raw materials is required in capacities up to 75 tons per hour, the Model WL *Feedoweight* is applicable. Fully illustrated bulletin 158 lists specifications, general arrangements, and operating ranges. Accessories for the Model WL *Feedoweight* included.

Merrick Scale Manufacturing Co.

MATERIALS HANDLING & STORAGE FACILITIES *continued*

371—Trackmobiles

Bulletin T-132 is a full color, 20 page booklet which describes in story book form the exploits of *Tricky the Trackmobile*. It illustrates in a highly informative and entertaining manner the many functions a Whiting *Trackmobile* can perform both on and off the rails. Completely illustrated.

Whiting Corp.

372—110 Ton Crawler Crane

Catalog 790-CG-1 describes the all-new, big capacity American 900 Series crane and 4½ yard excavator. The many exclusive features of this crane for handling heavy materials, are listed. Various components are completely described and illustrated. Actual on-the-job photographs show capacity of crane.

American Hoist & Derrick Co.

MECHANICAL POWER TRANSMISSION

373—Turbine Pump Drives

Bulletin 31 describes Johnson's right angle turbine pump drives, in standard and combination drive installations, in a wide range of models to meet specific requirements of prime movers and pumps. Introduces new *Redi-Torq* automatic combination drive. Includes illustrations, power ratings, and average efficiencies.

Johnson Gear & Manufacturing Co., Ltd.

To order personal copies of these bulletins, please fill out the card between pages 2 and 3 or 58 and 59.

376—Universal Joints

Bulletin CS-10 describes and illustrates the five standard sizes of bevel gear universal joints available. For remote control of valves, pumps, engines, antennae, ventilators, equipment in inaccessible locations. Operate at any angle from 0° to 135° on vertical center line, or from 0° to 360° on horizontal center line.

Condenser Service & Engrg. Co., Inc.

377—Fluid Drives

Bulletin A-719 describes American-Standard's *Gyrol* fluid drive for forced draft fan, centrifugal compressors, and other applications. Principles of fluid drive explained and illustrated with photographs and schematics. Installations, advantages, components, selection charts, dimensions included. Ordering data.

American-Standard Industrial Division.

374—Shaft-Mounted Speed Reducers

Bulletin F-2003 describes U. S. *Shaft-mount Syncrogear* speed reducer, depicts and explains features. Details how to select type and size required from table of 141 applications, gives hp rating tables of high and low ratios for speeds and frame sizes, dimension drawings, charts, ordering instructions.

U. S. Electrical Motors Inc.

378—Motor Reducer Drives

Fully illustrated booklet B-7223, 33 pages, includes recommendations, ratings, dimensions, and other application data to assist the consulting engineer in selecting the proper gearmotor or package motor reducer drive for his particular applications. Describes *Moduline* gear units for maximum adaptability.

Westinghouse Electric Corp.

375—Advances in Modern Gears

A 12-page bulletin which fully describes the advantages in using hardened and precision ground gears. Various applications such as radar-drive units, rotary-wing aircraft, high speed gas-turbine drives, dredge cutter drives, marine propulsion, and others are illustrated and their advantages discussed.

Philadelphia Gear Corp.

379—Variable Speed Magnetic Drives

Bulletin 263 describes a line of variable speed magnetic drives from 3 to 310 hp. Six models are offered. The drives are suited particularly for water and sewage pumping and can be used with any float or liquid level control. Bulletin illustrates construction and components. Contains charts and specifications.

Electric Machinery Mfg. Co.

MECHANICAL POWER TRANSMISSION *continued*

380—Flexible Gear Couplings

Advantages and typical applications of flexible gear couplings are pictured and described in 16-page catalog C-5, "The Revolutionary New Sier-Bath Flexible Gear Couplings." Couplings are available in standard, vertical millmotor, floating shaft, spaced type, and in many special purpose types.

Sier-Bath Gear & Pump Co., Inc.

381—Centrifugal Pump Drives

Catalog 32 shows applications, specifications, and engineering details of right-angle solid shaft gear drives for centrifugal pumps and many industrial uses. Also describes *Redi-Torq* drive for use with auxiliary engine to automatically eliminate service interruptions due to power failure.

Johnson Gear & Mfg. Co., Ltd.

MEETINGS, CONVENTIONS & TRAVEL

382—Chicago, Illinois

Folder describes the Acres Motel located on U. S. Route 41 in Chicago, Illinois. A convenient location whether you are headed north, south, or west. A few minutes drive from Chicago's Near North Side and only twenty minutes from the Loop. Swimming pool, TV, fine restaurant, individual temperature controls.

The Acres Motel.

386—Minneapolis, Minnesota

Colorful booklet describes and pictures the facilities of the Pick-Nicollet hotel in Minneapolis. Ideal facilities for conventions, meetings, and trade shows. Services include PA systems, television, moving picture projection, and other special equipment in this 600 room hotel Booklet shows modern decor.

Pick-Nicollet.

383—Galveston, Texas

Folder describes Hotel Galvez and Villa located less than one hour drive from Houston via super highway. Thirty mile beach, swimming pool, fishing, horseback riding, tennis and golf are offered for recreation. Completely air conditioned. Facilities of Moody Center available for conventions up to 3500 persons.

Hotel Galvez.

387—Mobile, Alabama

Folder describes Hotel Admiral Semmes located in Mobile, Alabama, the Azalea City and one of America's most interesting old cities. A warm and friendly atmosphere and accommodations offer the utmost in comfort and pleasure. Completely air conditioned, television and radio, automobile entrance.

Hotel Admiral Semmes.

384—Point Clear, Alabama

Grand Hotel, Point Clear on Mobile Bay, Alabama, ocers colorful booklet on the facilities they provide for the vacationer. An eighteen hole golf course has clubhouse with complete facilities for entertaining. Cruising, fishing, dancing, tennis, and swimming for recreation. Exquisite cuisine and flawless service.

Grand Hotel.

388—Fort Lauderdale, Florida

Folder describes Ruttger's By The Sea in Fort Lauderdale, Florida. Printed in full color, this folder shows deep sea fishing, swimming pool, relaxing areas, and beach facilities. Typical room, lounge, and dining room also shown. Nearby golfing, horse racing, Jai-Alai, and dog racing for entertainment.

Ruttger's By The Sea.

385—Washington, D. C.

Hotel Washington offers relaxed living. You can drive right into the hotel, via the motor lobby entrance and private registration desk. Dress as you please, your privacy is assured. Smart cocktail lounge, sky terrace, beautifully decorated modern rooms, superb food. Heart of shopping and theatrical districts.

Hotel Washington.

389—Birmingham, Alabama

Folder describes the facilities of Hotel Thomas Jefferson in Birmingham, Alabama. Rich, but unobtrusive, decor in luxurious suites is perfect for entertaining that special client. Completely air conditioned, TV, radio. Excellent meeting rooms make this hotel Birmingham's convention headquarters. Excellent food.

Hotel Thomas Jefferson.

MEETINGS, CONVENTIONS & TRAVEL *continued*

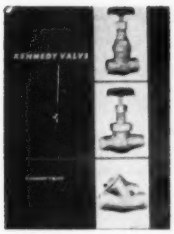
390—Alabama Convention Spot

Grand Hotel, with its adjacent Lakewood Golf Club, each year is host to numerous corporation board meetings and sales conferences, as well as to many smaller executive and golfing groups. For those desiring complete information we have a special convention kit. Delightful location, excellent cuisine.
Grand Hotel.

391—Chicago, Illinois

Folder describes the Acres Motel located at 5600 North Lincoln Avenue on U. S. Route 41 in Chicago, Illinois. Accommodations for every taste – single rooms, double rooms, kitchenettes, and apartments. Rooms have individual temperature control. Fine restaurant, swimming pool, and TV. Close to shopping center.
The Acres Motel.

PIPING, VALVES & PLUMBING SUPPLIES



392—Solder Joint Valves

Bulletin 581 describes the uses and construction features found in Kennedy solder joint valves for copper tubing installations. Cutaways, keyed to copy, show operation. Also gives detailed dimensions and instructions on installation. These valves for use on types K, L and M copper tubing.
Kennedy Valve Mfg. Co.

396—Specialty Valves

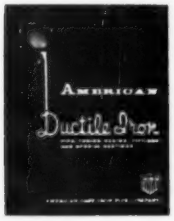
Bulletin 216 is condensed and compact catalog which describes the Powell line of bronze, iron, steel, alloy, lubricated valves, liquid level gauges and other specialties. All products listed are illustrated. Cutaways show construction details. Available sizes, pressure and temperature ratings listed.
Wm. Powell Co.

393—Wedge-Lock Clay Pipe

Bulletin R-359-87 describes Robinson's *Wedge-Lock* clay pipe. Shows how it provides tighter joints to resist roots and combat infiltration in the house, in the ground, and under basement floors. Installation procedures for *Wedge-Lock* factory-made joints are illustrated. Line of fittings pictured. Applications given.
Robinson Clay Products Co.

397—Ball Float Traps

Bulletin SS46 describes complete line of Strong continuous flow ball float traps. Application data, list prices, detailed specifications, dimensions, cutaway drawings, capacities, and installation diagrams are included. New steel and semi-steel side-inlet models, with wide pressure-temperature limits included.
Strong, Carlisle & Hammond.



394—Iron Pipe, Tubing, and Fittings

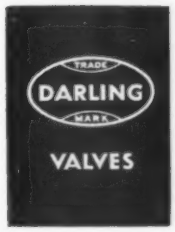
Catalog L-127 describes the complete line of American ductile iron pipe, tubing, casings, fittings, and special castings. Includes valuable technical information; grades, specifications, dimensions, and weights. Typical applications include underground piping, industrial piping, well casing, and many others.
American Cast Iron Pipe Co.

398—Rubber Seat Butterfly Valves

Bulletin 10J is a new catalog describing the new *Monoflange* Mark II rubber seat butterfly valve. The catalog has been designed to be the ideal working tool for engineers and users of this type equipment. Complete specifications, flow data, certified drawings, weights, freight rates, and prices are included.
Henry Pratt Co.

395—Plastic Pipe Systems

Handbook 1159 describes plastic ball valves, check, foot, 3-way cock, needle, and globe valves made in five basic materials to handle a wide range of corrosive chemicals at temperatures up to 250°F. Working pressure at various temperatures charted and five basic materials rated as to chemical resistance.
Chemtrol.



399—Gate and Check Valves

Catalog 57 describes Darling's line of gate valves and check valves in iron, bronze, steel, and special alloys for all types of valve application. Also included are fire hydrants and accessories for fire protection. This 244 page bound volume gives specifications, pictures, facilities, and illustrates product applications.
Darling Valve & Manufacturing Co.

PIPING, VALVES & PLUMBING SUPPLIES *continued*

400—Fiberglass Drinking Fountains

Bulletin Cat-460 gives full details and specifications for Haws colorful fiberglass drinking fountains. Lightweight, wall-mounted models are vacuum molded, acid-resisting fiberglass. Color chart shows 6 permanent decorator colors available at no extra cost. Heat and pressure laminated; 1, 2, or 3 bubblers.

Haws Drinking Faucet Co.

401—Butterfly Valves

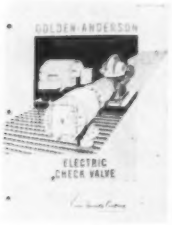
Bulletin 590X offers a valve for piping or equipment where positive, bubble-tight or drop-tight closure is needed at operating pressures to 150 psi. Occupies a small fraction of space needed for gate or globe valves. Manual or automatic control. No fouling and it is self-cleaning.

W. S. Rockwell Co.

402—Jointed Vitrified Clay Pipe

Jointed vitrified clay pipe known as *Amvit*, with a built-in mechanical joint made from polyvinyl chloride, is described in four-page folder. Advantages such as infiltration prevention, quick installation, immediate backfilling, better flow, shock absorption, and quick testing in the field are pointed out.

American Vitrified Products Co.



403—Electric Check Valves

Bulletin W-10A describes the G-A Electric Double-Cushion Check Valve that does not open until pump comes up to speed. Starts closing while pump is running, and when 95% closed, shuts down pump, eliminating shock. Includes ordering requirements, dimensions on globe and angle cross-section views.

Golden Anderson Valve Specialty Co.

404—Pump and Compressor Connectors

Bulletin FP-4 describes *Flexpipe*, the flexible connector for pumps and compressors. Flexpipe connectors dampen noise and vibration and permit expansion and contraction in piping. Engineering data, sizes, and part numbers are included. Diversified applications shown in photographs.

Anaconda Metal Hose Division.

405—Small Forged Steel Gate Valves

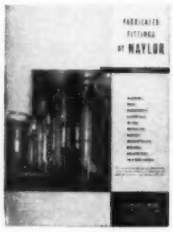
Bulletin AD-2437 describes Crane's newly designed small forged steel gate valve with "XU" universal trim for all services, at temperature up to 1000°F. The many features of this new valve are shown in a cutaway with keyed captions. Service recommendations include table of working pressures and sizes.

Crane Co., Industrial Products Group.

406—Gate Valves

Bulletin VC3-H describes a new gate valve that can be throttled like a globe. Tables showing rating, pressure, operating temperatures, and many uses are included. Available in both solder end and threaded end. The size range is listed along with dimensions and cutaways. Air, water, oil and gas.

NIBCO Inc.



407—Fabricated Pipe Fittings

Bulletin 525 illustrates standard and special fabricated fittings which help in planning piping and equipment layouts. Data includes specifications and prints on standard fittings for lightweight pipe. The bulletin also illustrates special fabrications designed to save time and labor.

Naylor Pipe Co.

408—Pressure Sealed Steel Valves

Bulletin DH-400 describes and gives detailed information on R-P&C pressure sealed bonnet joint cast steel valves especially adapted for high pressure, high temperature steam service. Advantages are outlined. Cutaways show construction and operation. Dimensions included.

American Chain & Cable Co., Inc.
R-P&C Valves Division.

409—Flexible Gaskets for Coupling

Technical brochure describes and illustrates the use of Hamilton Kent's "Tylox C-R" flexible gaskets for coupling recessed pipe of all sizes. Gaskets are of a special cross-section design to prevent distortion as pipe is coupled. Diagrams show how gasket works. Photographs show method of installation.

Hamilton Kent Manufacturing Co.

410—PVC Pipe Fittings and Valves

Bulletin of engineering information on PVC plastic pipe, fittings, and valves. Specification, design, and installation information is included as well as a comprehensive corrosion resistance comparison chart for seven types of plastic pipe carrying 162 chemicals. Charts show fluid and gas flow characteristics.

Kraloy Plastic Pipe Co., Inc.

411—Snow Melting Systems

"Steel Pipe Snow Melting and Ice Removal Systems," 32 pages, presents the case for snow melting systems and shows typical installations in commercial and industrial locations. Design data is complete with information on antifreeze mixtures, sizes, and spacing.

Committee of Steel Pipe Producers,
American Iron and Steel Institute.

PIPING, VALVES & PLUMBING SUPPLIES *continued*

412—Valve Controls

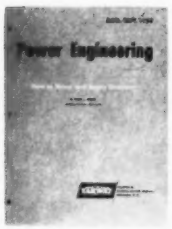
Bulletin 1-60 fully describes the most popular type of *Limitorque* Valve Operator. What *Limitorque* is, does, and operates are clearly explained. Also, contained are complete dimensions and parts lists with drawings. Preferred mounting positions, operating tips and supplementary equipment illustrated.

Philadelphia Gear Corp.

413—Tin-Lined Pipes, Fittings, Valves

Bulletin 139 describes Barnstead's complete line of tin-lined pipes, fittings, and valves. Combining the chemical protection of pure tin with the strength and durability of threaded pipe, this tin-lined equipment protects the purity of distilled water from the point of origin to the point of ultimate use.

Barnstead Still & Sterilizer Co.



414—Strainer Selection Data

Two article reprints bound into a single 8-page brochure describe the many types of strainers available and the data important in their selection and application. Tables compare maximum areas of openings and pressure ratings. A graph provides determination of pressure drops through various strainers.

Yarnall-Waring Co.

415—Pressure Reducing Valves

Bulletin C-89A describes Fisher pressure reducing valves, relief valves, lever valves, float valves and strainers for automatic flow control of steam, water, air, gases, and process liquids. Charts covering size, specifications, dimensions, pressure ranges and ratings, and capacities are included.

Fisher Governor Co.

416—Precision Control Valves

Catalog A243 describes all types of precision control valves manufactured by the Kohler Co. Cutaways and exploded views show construction and operation of various types of valves. Sizes and engineering data in table form is included. The many valve applications are listed. Branch sales office addresses given.

Kohler Co.

417—Insulated Piping Systems

The new edition of the Ric-wiL product catalog covers construction features for prefabricated, insulated piping systems for steam, hot water, oil, or refrigeration distribution lines. Types of systems covered include *Hel-cor, Uniline, Type* J, and cast iron. Prefabricated accessories are also included.

Ric-wiL, Inc.

418—Vitrified Clay Pipe

Bulletin PS-101 describes Kaul Clay Company's *Presto SEAL* vitrified clay pipe. Socket and spigot ends are factory-molded polyester, with a rubber gasket permanently imbedded in the socket end. When socket and spigot ends of pipe are joined, a perfect, permanent, flexible seal is made in seconds.

Kaul Clay Co.

419—Polyethylene Plastic Pipe

Polyethylene plastic pipe is a flexible pipe for both hot and cold water. This bulletin describes its features of economy and durability. Lists its many areas of use, plus the varieties available from Keasbey & Mattison. Industry, agriculture, homeowners, and municipalities are some of its many markets.

Keasbey & Mattison Co.

420—Water Works Brass Goods

Water works brass goods bulletin WW-58 illustrates and describes McDonald water service products. Included are curb stops, corporation stops, goosenecks, meter stops and couplings, service boxes. Each product offered is pictured with description and necessary specifications.

A. Y. McDonald Mfg. Co.

421—Tapping Machines

Bulletin W-8912 describes Mueller's double pressure chamber tapping machine, the B-100. This machine makes faster taps; assures pressure tight connections; provides trouble-free operation. Can be used by hand or power. Cutaway shows construction and operation. List and pictures equipment.

Mueller Co.

422—4-Way Single Solenoid Valves

Supplement to bulletin 8344 describes the new ASCO single solenoid valves (¼" and ⅜" pipe sizes) which handle water, air, and hydraulic oil at pressures to 250 psi, temperatures to 212°F. Features, application, dimensions, operation, and list prices are given. Diagrams show operation.

Automatic Switch Co.

423—Cast Iron Pipe

Catalog of cast iron pipe, fittings, fire hydrants, water works gate valves. Specifications, dimensions, and weights of bell and spigot, mechanical joint, flanged pipe, and fittings covered. Mathews Modernized, Mathews Flanged Barrel, and R. D. Wood Swivel Joint fire hydrants described. Also Wood gate valves.

R. D. Wood Co.

PIPING, VALVES & PLUMBING SUPPLIES *continued*

424—Nonlubricated Plug Valves

Twelve-page catalog 581 GP contains specification of all sizes (1 to 4 in.) and pressures (1000 psi to 10,000 psi CWP) of Graham nonlubricated plug valves. Cutaway view shows construction details of this round port, full opening valve. Photographs of valves, parts lists, body and trim materials included.

Texsteam Corp.

425—Pyrex Drainline Systems

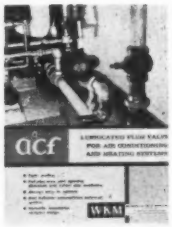
Bulletin PE-30 describes Corning Glass Works' *Pyrex* brand lifetime drainline system, guaranteed against corrosion and leakage for the life of the building. Specifications, fittings, and sizes are shown in table form and diagram. Simple installation procedures illustrated and described. Distributors listed.

Corning Glass Works.

426—Steel Pipe and Couplings

This new bulletin gives sizes, lengths, threads, weights, and carton contents of merchant, half and API line pipe couplings plus other information including complete specifications on standard, extra strong, double extra strong, and structural pipe. Illustrated and printed in two colors on durable stock.

Wheatland Steel Products Co.



427—Lubricated Plug Valves

How ACF lubricated plug valves can save money and add efficiency to hot and chilled water air conditioning systems is described in Bulletin AP 1059. These valves are ideal for use as balancing cocks, condenser return, boiler and chiller feed, gas, water, or oil supply valves. Illustrated.

W-K-M, Division of ACF Industries, Inc.

428—Pipe Branch Connection Fittings

Bulletin TF-1-59R describes Porter's new precision contoured *TeeLet* and *Fishmouth* welded branch connections. Speeds installation on the job and requires no shaping, fitting, beveling, or extra alignment. Installation methods pictured. Specifications include construction, sizes, dimensions. pressures, weights.

H. K. Porter Co., Inc.

429—Stainless Steel Fittings

This 22-page catalog explains how Speedline stainless steel fittings reduce piping costs by allowing the designer to take advantage of the new and more economical schedules 5 and 10 stainless steel pipe. A schematic drawing illustrates industrial applications.

Speedline Fittings Division
Horace T. Potts Co.

430—Water Hammer Arresting Unit

Shoktrol manual 60-2 and form 37-ADV describes in detail the new Zurn water hammer arresting unit for eliminating damaging shock in liquid systems. The only all stainless-steel, air precharged unit available. Contains complete specifications. Companion piece, *Shoktrol-Sizer*, describes method for scientifically sizing.

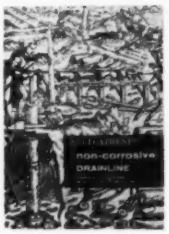
Zurn Industries, Inc.

To order personal copies of these bulletins, please fill out the card between pages 2 and 3 or 58 and 59.

431—Jacketed Pipe and Fittings

Bulletin J-57 describes pipe, welded steel fittings, spring loaded plug valves, and valves all jacked, manufactured by Hetherington & Berner Inc. Different types of valves and fittings are illustrated together with cutaway photographs showing construction and operation. Also jacketed pumps and flexible hose.

Hetherington & Berner Inc.



432—Non-Corrosive Drainline

Booklet gives all necessary information on Vulcathene integrated drainline system which includes pipe, fittings, traps, and sinks. Includes recommended uses, advantages, characteristics, layout, and design. All types of drainline fittings are illustrated and give dimensional information. Accessories listed.

American Vulcathene Div.

433—Bronze Gate Valves

Bulletin 573 shows the many new construction features of the Kennedy 125-lb. gate valve in cylindrical body construction. Cutaway shows construction and operation. Additional features include new hex end design, Kenalloy stem and handwheel. Conform to Federal Specifications WW-V-54 Type 2 Class A.

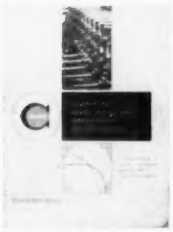
Kennedy Valve Mfg. Co.

434—Wedge-Lock Type "O" Joint

New Robinson *Wedge-Lock* Type "O" joint for vitrified clay pipe is described and illustrated in folder R-460-110. Solves many water handling problems. Specifications of the new joint as well as testing methods used are detailed in the folder. Suggestions on specifying Type "O" joint also included.

Robinson Clay Product Co.

PIPING, VALVES & PLUMBING SUPPLIES *continued*



435—Corrosion Resistant Valves

Catalog 1159 describes Chemtrol's complete line of corrosion resistant plastic valves manufactured in polyvinyl chloride Type I and II, acrylonitrile-butadiene-styrene (Kralastic), polypropylene, and Penton. Ball, check, 3-way, needle, globe, ball-cock and foot valves are available for immediate shipment.

Chemtrol.

436—Ductile Iron Steam Traps

Bulletin SS-142B describes Strong's ductile iron steam traps. This newest metallurgical development, adopted by ASME, enables Strong to produce traps for service up to 500 psi and 650°F with ample safety factor. List prices, capacities and dimensions shown in tables. Cutaway shows construction. Illustrated.

Strong, Carlisle & Hammond.

437—River Crossing Pipe

Booklet L-115 describes American *Molox* ball joint pipe for river crossings and other difficult installations. Map shows various locations of installations. Gives description, suggestions for use, method of assembling. Many pictures are used showing actual installing of pipe. Complete specifications on all diameters.

American Cast Iron Pipe Co.

438—Eccentric Plug Valves

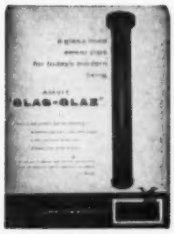
The newest W-K-M product, the eccentric plug valve is described in Bulletin AE-1059-B. Amazingly simple in design, construction, and operation, the EC Valve is ideal for sewage and waterworks services. Sizes available now are ¼" through 12" with larger sizes on application; working pressure — 150 lbs.

W-K-M- Division of ACF Industries, Inc.

439—Hydraulic Check Valves

Bulletin WS-1A describes the G-A Double Cushioned Check Valve that prevents damaging hammer and shock due to back surge. Installation is recommended on boiler feed lines, steam pumps, compressors and reciprocating pumps. Water, oil, gas and other fluids can be handled. Technical illustrations.

Golden Anderson Valve Specialty Co.



440—Glass Lined Sewer Pipe

Folder deals with the glass-lined sewer pipe with a mechanical joint. *Amvit Glas-Glaz* pipe is available in 4-ft lengths. It is root and infiltration proof and is glass coated inside and out. The pipe has been designed for an under-the-house drain and also as a house-to-street sewer. Assembly operations shown.

American Vitrified Products Co.

441—Drinking Fountains

Haws catalog gives fully detailed information and specifications for complete Haws line of drinking fountains, electric water coolers, deck-type fountains, emergency eye-face wash and drench shower equipment, Haws-Kramer flush valves, laboratory fixtures, miscellaneous faucets, fixtures, accessories, and parts.

Haws Drinking Faucet Co.

442—Butterfly Valves

Bulletin 5904 is a comprehensive 36-page catalog on Darling-Pelton rubber seated butterfly valves and operators. Catalog contains information on Darling-Pelton valves, designed in accordance with AWWA specifications for hydrostatic operating pressures up to 125 psi and velocities up to 16 feet per second.

Darling Valve & Manufacturing Co.

443—Wet Heating Connectors

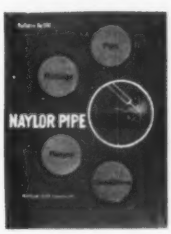
Bulletin FP-5 describes Anaconda Flexpipe connectors used to compensate for travel, absorb vibration, and connect misaligned ports in piping in wet heating systems. Made of tin-bronze and available in standard sizes. Cross-section shows construction. Typical uses are detailed and illustrated.

Anaconda Metal Hose Division.

444—Bar Stock Valves

Bulletin DH-766-B gives complete information on R-P&C bar stock valves. Available in a range of metals and sizes for applications requiring close control valves capable of withstanding a wide range of working temperatures and pressures. Completely illustrated.

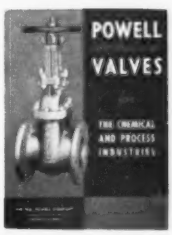
American Chain & Cable Co., Inc.
R-P&C Valves Division.



445—Lightweight Pipe and Fittings

New 8-page condensed catalog summarizes complete line of Naylor lightweight pipe, fittings, flanges, and connections. Lists typical applications. Includes standard specifications on pipe from 4 to 30 inches diameter, together with details on standard fittings and flanges. Covers couplings for pipelines.

Naylor Pipe Co.



446—Corrosion Resistant Valves

Bulletin 229 describes Wm. Powell Company's corrosion resistant valves for the chemical and process industries. Many valves in the complete line are illustrated. Materials in which they are available, pressure and temperature ratings, construction details, and dimensions are given. Cutaways shown.

Wm. Powell Co.

PIPING, VALVES & PLUMBING SUPPLIES *continued*

447—Corrosion Resistant Valves

Bulletin 802D describes Rockwell's compact, diaphragm-disc type, valve, Penton coated for corrosion resistance, with pneumatic operator. A low cost packaged unit resistant to most chemical fluids to 180°F. Features are outlined. Line drawing shows operation of automatic valve. All valves illustrated.

W. S. Rockwell Co.

449—Jointing Flexible Gaskets

Technical brochure describes and illustrates the use of "Tylox C" and "C-P" sewer pipe jointing flexible gaskets. Gaskets are for single or double offset pipe of all sizes. Diagrams show gaskets properly positioned and under full compression. Photographs show installation procedures. Coupling methods diagramed.

Hamilton Kent Manufacturing Co.

448—Steel Fittings

Catalog H-2 provides information about the complete "Husky" line of carbon steel welding fittings for schedule 40 piping. Technical data is included for straight and reducing tees, concentric and eccentric reducers, 45° elbows, 90° elbows. Practical advantages of "Husky" fittings and performance tables.

NIBCO Inc.

450—Flexible Wedge Disc Gate Valves

Bulletin AD-2426 describes Crane's new line of improved 150- and 300-pound steel gate valves. Cutaway shows construction and operation. How the flexible wedge disc works is explained and illustrated. Included are pressure ratings, material specifications, test pressures, and dimension tables.

Crane Co., Industrial Products Group.

PLANT SITES

451—Industrial Opportunities

A colorful new presentation of Colorado's industrial opportunities. Included are booklets on manufacturing, power, raw materials and resources, transportation, markets and labor, colorado living, industrial site locations, state highway map, and full color recreation booklet. Up-to-the-minute data in portfolio form.

Colorado Department of Development.

To order personal copies of these bulletins, please fill out the card between pages 2 and 3 or 58 and 59.

POWER EQUIPMENT & FUELS

452—Air Intake Cleaner Silencers

Bulletin 273 describes the Burgess-Manning combination air intake cleaner and silencer snubber widely used in all branches of industry on the intake of internal combustion engines, compressors, turbines, and blowers. Bulletin contains details of design and construction and cross-section drawings.

Burgess-Manning, Industrial Silencer Div.

453—Forced Draft Burner Systems

Specifications for 6 sizes and 7 types of the self-contained Todd *Roto-Pac* fully automatic forced draft burner systems are given in bulletin TD60-4X. Operating on gas, oil, or combination with automatically fired boilers or furnaces to 3,500,000 Btu/hr., *Roto-Pac* performance is summarized.

Todd Shipyards Corp., Products Div.

POWER EQUIPMENT & FUELS *continued*

454—Vented Deaerators

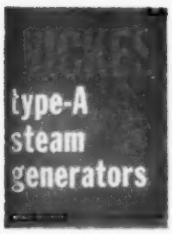
Bulletin 1300 explains simple, fully vented deaerator that assures positive, economical oxygen removal to .03 cc/-liter from feed water, heating equipment, and return lines. Illustrates operating principle and components. For boiler plants with capacities from 1,000 to 30,000 lbs/hour. Representatives listed.
Fred H. Schaub Engineering Co.

455—Oil and/or Gas Fired Boilers

Bulletin 1260 describes and illustrates *Powermaster* Model 3 line. Includes gas, oil, and combination gas/oil models, a new specially designed hot water boiler, and the new steam atomizing principle for use with No. 6 oil. Ratings and dimensions of all sizes in line are included. Cutaway shows operation.
Orr & Sembower, Inc.

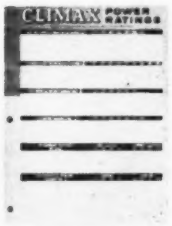
456—Vibra-Grate Stokers

Catalog S-546-A describes water-cooled, vibra-grate stoker, outlining five major advantages. Stoker fires large or small boiler economically and efficiently. Operating principle outlined and construction features illustrated. Included are 16 diagrams of actual installations.
American Engineering Co., Div. of United Industrial Corp.



457—Steam Generators

Wickes type-A steam generators, compact, efficient, shop assembled water tube boilers, are illustrated and described in catalog 56-1. It gives typical superheater arrangements for the boilers with section, plan, and side views of drainable "S", pendant, and drainable superheaters. Specifications are given.
Wickes Boiler Co.



458—Engines

Bulletin SA-612-B, a complete listing of all Climax engines and complete power unit ratings showing maximum hp available for bare engines and recommended operating ratings for various applications of power units with accessories. Complete bulletins describing all models shown in the power chart are available.
Climax Engine Manufacturing Co.

459—Bent Tube Boilers

Bulletin VF VS-2 presents design and construction details and illustrates installations in a diversity of industries. Basic design of these two drum units provide maximum capacity where floor space and head room are limited. Furnaces handle fluids fired in suspension or with various types of stokers.
Henry Vogt Machine Co.

460—Incinerator Stoker

Bulletin 701 presents for the first time a new reciprocating grate stoker for use in municipal and industrial incinerators. Standard modular units provide maximum flexibility of application at minimum installation cost. Ingenious design assures higher burning rates and greater efficiency, less attendant labor.
Detroit Stoker Co.

461—Engines and Generator Sets

Complete 80-page catalog includes power curves, sectional drawings, and subassembly photographs of six basic engines in 19 models, a power range of 100 to 2150 bhp. Diesel, gas, and dual fuel engines and generator sets are available as a custom installation.
White Diesel Engine Division, White Motor Co.

462—Waste Heat Recovery

Bulletin WHB 59-3 describes the economic utilization of excess heat developed from diesel exhaust gases and industrial and chemical processes. Specific industrial, marine, and chemical applications of varying capacities and services are illustrated. Advantages of bare tube and extended surface designs are noted.
Foster Wheeler Corp.

463—Water Tube Packaged Boilers

A completely new line of low and high pressure forced-draft water tube packaged boilers is described in bulletin 1400. Known as the *Compak* series, these factory-tested units are offered in 22 sizes ranging in capacity from 12 through 750 horsepower. Engineering specifications with catalog literature.
International Boiler Works Co.

464—Packaged Boilers

Catalog VP-3, 16 pages, describes the new Type VP package boiler. Following a section of background information is an outline of principal design features. These boilers are shop assembled and provide steam capacities from 4000 to 90,000 lb per hr. Space requirements and specifications are in table form.
Combustion Engineering, Inc.

465—Turbine Oil Filtering Equipment

Bulletin 14F illustrates and describes Nugent packaged turbine lube oil filtering equipment which consists of gravity type filter with water separating compartment, motor driven oil circulating pump, pressure type oil polishing filter, and sight flow indicator. Photographs and diagrams included.
William W. Nugent & Co., Inc.

POWER EQUIPMENT & FUELS *continued*

466—Air-Jacketed Silencers

Data Sheet D-192 describes Maxim air-jacketed silencers which not only suppress engine noise to desired levels, but also provide an economical means of ventilating engine rooms and surrounding areas. Line drawings show horizontal and vertical installations.

Maxim Division
American Machine & Foundry Co.

467—Packaged Steam Generators

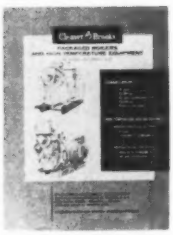
Bulletin B-3255 describes Titusville's Type WTP packaged steam generators with steam capacities from 10,000 lbs to 60,000 lbs per hour. Construction, performance, and maintenance are discussed. Outstanding features given. Bulletin B-3255-A includes line drawings and specifications on various sizes.

Titusville Iron Works Co.

468—Commercial Gas Burners

Bulletin 1628 describes commercial gas burners available in capacities up to 5,100,000 Btuh input. Combinations also assembled up to 15 million Btuh. Nearly silent operation, no refractory combustion chamber, full capacity without electric power. For steel and cast iron heating and process boilers.

Iron Fireman Manufacturing Co.



469—High Temperature Equipment

Cleaver-Brooks catalog AD 167 describes packaged boilers and high temperature equipment. A line of boilers with unique hinged doors and fully automatic controls. Design standards, advantages, engineering service, specifications, ratings, dimensions, and recommended boiler room layouts included.

Cleaver-Brooks Co.

470—Modular Nuclear Power Plant

Spring-Summer, '60 *Alco Review* features first modular nuclear power plant, the Army PM-2A, built by Alco and being installed this summer in Greenland. Article includes description, story of design and building, and design data. Other articles treat tunneling, wellhead valve, and pipeline diesels.

Alco Products, Inc.

471—Forced-Draft Burners

Bulletin describes compact forced-draft package unit burner. This single, coordinated, factory-tested assembly, ready for attachment to boiler, combines all necessary equipment for burning oil or gas fuels. Gives details of design and features. Diagrams are keyed to chart giving dimensions for all models.

S. T. Johnson Co.

472—Complete Packaged Boilers

Twelve-page catalog describes Type AS Superior packaged boilers for capacities from 4000 to 21,000 lbs steam per hr. Complete packages with rotary burners, integrated controls, soot blowers, refractory, and insulation, these units also have quiet rear mounted draft fan which provides air-cooling of furnace floor.

Superior Combustion Industries, Inc.

473—Industrial, Commercial Burners

Bulletin 1 describes Industrial Combustion's *Hev-E-Oil* burners for industrial and commercial use. These burners are expressly engineered to make use of low-cost, high-heat content heavy fuel oils. Installations are pictured. Cutaway and line drawing show construction and operation. All models illustrated.

Industrial Combustion Inc.

474—Packaged Boilers

Bulletin 200A describes Johnston Brothers 200 Series packaged boilers. For steam or hot water in sizes 20 through 80 hp. Components are pictured along with complete descriptions. Line drawings shows operation. Extra equipment is listed and detailed. Specifications and dimensions are given in tabular form.

Johnston Brothers, Inc.

475—Condensate Return Units

New Bulletins 900 and 910 fully describe Weinman Types ACV and ADV simplex and duplex condensate return and boiler feed units with either steel or cast iron receivers that provide trouble-free service in all types of "wet" heating systems. Drawings, charts, and selection tables are included.

Weinman Pump Manufacturing Co.

476—Packaged Air Preheater

The important points to consider in selecting a preheater for use with small boilers (25,000 to 250,000 lbs per hr) are discussed in four-page bulletin on the new package Ljungstrom air preheater. Explains how preheater saves fuel, increases boiler output and reliability, and permits use of lower grade fuels.

Air Preheater Corp.

477—Turbine Steam Generators

Power plant consultants will find bulletin 03B9448, "Large Steam Turbine Generating Units", very valuable. Advanced designs from 62.5 to 600 mw are highlighted. Outdoor and nuclear-powered applications are discussed. Controls, manufacturing facilities, testing, installation, and service described.

Allis-Chalmers.

POWER EQUIPMENT & FUELS *continued*

478—Induced Draft Bifurcater

Bulletin DB-44-56 describes DeBothezat's induced draft bifurcator, which provides instant, adequate draft eliminating costly stacks. Construction features are listed and illustrated with cutaway. Installation photographs, boiler code ratings, selection data, dimensional drawings.

DeBothezat Fans, Division of American Machine & Metals, Inc.

479—Diesel Engines

Bulletin 40-20169 describes diesel engine power by Caterpillar. Includes specifications and illustrations of four-cycle diesels for any job, modern power plants with compact generators, and marine engines for continuous duty. Engines and attachments adaptable into engine packages for special needs.

Caterpillar Tractor Co., Engine Division.

480—Packaged Steam Generators

New six-page bulletin entitled "More Performance From Less Investment" describes in detail Cyclotherm's line of 18 sizes of package steam generators, 15 hp to 650 hp. Also specifications on 10 sizes of new package hot water generators, 670 mbh to 6700 mbh. Cutaways and line drawings show operation.

Cyclotherm Division of Crane Co.

481—Packaged Steam Generators

Type CC Superior Packaged Boilers for capacities from 20 to 350 bhp are described in this 3 color catalog. Unusually compact, providing economies of installation, the Type CC has four-pass design, 5 sq ft of heating surface per bhp, and induced draft. Data and dimensions for units to burn oil, gas, or both.

Superior Combustion Industries, Inc.

482—Transfer Oil Heater

Bulletin 25A-1 describes the 100% automatic, no freezing, no corrosion operation of the Texsteam 25 A transfer oil heater which provides temperatures to 600°F with low pressure vessels and flow circuits. Unit is gas or oil fired. Bulletin includes specifications and curve for sizing to specific applications.

Texsteam Corp.

483—Water Gate Hoists

Catalog GH-353 describes gate hoists specifically designed to control water levels on hydro-electric power plant installations. Illustrates some typical hoists. Lists types of stationary and traveling gate hoists and the types of power dam gates for which they are applicable. Capacities from 1 to 100 tons.

D. J. Murray Manufacturing Co.

484—Opposed Piston Diesel Engines

Bulletin 3800D8-S1 describes and illustrates design and construction features of Fairbanks-Morse opposed piston diesel, dual fuel, spark ignited, and turbo super charged engines for electric power generation, pump drives, marine propulsion, and other industrial and commercial uses. Cutaways show structure.

Fairbanks, Morse & Co.

485—Shot Cleaning System

Bulletin 2145 covers the new Diamond shot cleaning system for the most efficient and economical cleaning of such external horizontal tube surfaces as superheaters, reheaters, economizers, and air heaters. Gives advantages, principles, construction, and operation. Chart shows draft loss from ineffective cleaning.

Diamond Power Specialty Corp.

486—To Determine Power Plant Costs

Three-page pamphlet provides quick, easy method to determine costs of boiler and electric generating plants on a predesign basis during early planning stage. Contains two 4-quadrant graphs, with easy instructions, applicable to boiler plant capacities up to 1 million lb/hr and electric generating to 100,000 kw.

National Coal Association.

487—Spreader Stokers

New bulletin 860 illustrates and describes the Detroit *RotoStoker*, a spreader stoker with overthrow rotor feeders. For use with medium size boilers up to about 60,000 pounds of steam per hour capacity. Power dumping, hand dumping, or stationary grates. May be installed in almost any type boiler.

Detroit Stoker Co.

488—Commercial and Industrial Burners

Bulletin 1255 describes fuel burning systems for heating, power, and process requirements. Air or air/steam atomizing burners and partial pre-mixing gas burners are described. Burner arrangements illustrated. Fuel consumption ranges from 20 gph to 300 gph on oil and 3,000 cfh to 40,000 cfh on 1,000 Btu gas.

Orr & Sembower, Inc.

489—Condensate Drainage Control

Bulletin 6025-A describes Cochrane's C-B system of returning condensate to boilers at high pressure and high temperature. Detailed explanation is illustrated with multi-colored schematics, graphs, and photographs. Contains unit specifications, selection chart. Dimensions for standard and high differential units.

Cochrane Corp.

POWER EQUIPMENT & FUELS *continued*

490—Square-Heat Packaged Boilers

Bulletin 1145 covers the new line of Kewanee square-heat forced draft packaged units in 12 sizes ranging from 9 hp to 54 hp. Equipped for light oil, gas or combination firing. Shipped completely assembled and jacketed. Bulletin gives complete selection data and engineering specifications. Illustrated.

American-Standard Industrial Division.

491—Cyclone Strainers

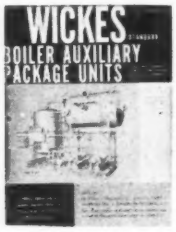
Designed specifically for power plant applications, the Pratt cyclone strainer features automatic cleaning and backwashing. Any reasonable pressure drop requirements can be met. Unique design costs less to install. Pratt Bulletin S-1 illustrates and describes strainer and gives all pertinent information.

Henry Pratt Co.

492—Internal Combustion Engines

Catalog EN303 describes 4-cycle, short-stroke, air-cooled internal combustion engines manufactured by Kohler Company. Each model is illustrated. General specifications, dimensions, and various applications given. Use of engines in various types of equipment are shown in photographs. Other Kohler products.

Kohler Co.



493—Boiler Auxiliary Packaged Units

Bulletin 59-1 describes auxiliary package units available for boilers of 10,000 to 100,000 lbs steam per hour, steam pressure to 300 psig. Units have various combinations of deaerating feedwater heaters, boiler feed pumps, condensate surge tanks to reduce maintenance and to increase plant efficiency.

Wickes Boiler Co.

494—Automatic Coal Firing Units

Catalog F-520 describes Perfect Spread Stoker, a compact automatic coal firing unit capable of supplying and distributing from 50 to 7500 pounds of coal per hour. Diagrams show operation and cutaways components. Features illustrated. Typical installations diagramed.

American Engineering Co., Div. of United Industrial Corp.

495—Heat Recovery Snubbers

Bulletin 272 describes the Burgess-Manning heat recovery snubbers that employ standard weight pipe coil as the water carrier and heat transfer surface, and two-chamber snubber for silencing. Bulletin contains cutaway drawings, engineering diagrams, specifications tables, photographs, heat transfer nomographs.

Burgess-Manning, Industrial Silencer Div.

496—Feed Water Deaerators

Bulletin 575-A explains continuous boiler feed water deaeration under .005 cc/liter without vent loss or adjustment, over a 10-to-1 load swing, without sodium sulphite. Illustrates operating principle and components. For boiler plants with capacities from 3,000 to 125,000 lbs/hour. Specifications are included.

Fred H. Schaub Engineering Co.

497—Rotary Oil Burners

The new Todd Series B rotary fuel oil burners are summarized in four-page bulletin TD56-82X. It includes a burner size selector chart and lists 11 advanced design features of seven basic sizes rated from 400,000 to 22,500,000 Btu per hr, with oil capacity from 3 gal per hr to 150 gal per hr.

Todd Shipyards Corp., Products Div.

498—High Temperature Generators

Advantages of International-LaMont high temperature water generators are described in bulletin 1600. Engineering data section gives factual comparison between HTW and high pressure steam systems along with pertinent cost considerations. Typical pressurization and pumping arrangements discussed.

International Boiler Works Co.

499—Disposable Bag-Type Filters

Bulletin 7E illustrates and describes Nugent's disposable recharge bag-type filters for filtering fuel oil, lubricating oil, and a wide variety of fluids. Design, construction, and operation is explained in detail and illustrated with line drawings. Complete specifications and capacity tables in chart form.

Wm. W. Nugent & Co., Inc.

500—Packaged Boilers

Bulletin B-3456 describes the features of the Titusville-Atlas patented wet back boiler and burner. Designed for high or low pressure, steam or hot water for heating or processing. Cutaway model shows patented wet back and line drawing shows operation. Bulletin B-3456A and B give data on 2- and 3-pass units.

Titusville Iron Works Co.

501—Municipal Engines

Bulletin SA-631 describes the complete line of Climax engines built for municipal plant service. These engines, from six to twelve cylinders and from 60 to 600 hp, are available for all sewage and water treatment plant applications. Climax engines are noted for simple, rugged construction and smooth operation.

Climax Engine Manufacturing Co.

POWER EQUIPMENT & FUELS *continued*

502—Stationary Diesel Engines

Bulletin 110 describes Models 60 and 80 *Superior* stationary diesels. Four-cycle, 6- or 8-cylinder, in-line models, ranging from 530 to 2000 bhp and from 300 to 1250 kw. Typical applications are water works, sewage plants, power plants, and others. Specifications given.

White Diesel Engine Division, White Motor Co.

503—Coal-Fired Packaged Boilers

Bulletin PG-59-4 describes semi-automatic stoker-fired packaged boilers now available in standard sizes of 43,000, 50,000 and 63,000 lb of steam per hour. Performance characteristics are given in graph and table form. Photographs and line drawings of the water-tube units show installation and construction details.

Foster Wheeler Corp.

504—Packaged Generators

New 3-pass low pressure steam or hot water package generator in 12 sizes up to 60 hp is described in Bulletin 6464. For firing natural gas, light oil or dual fuels. Features include shipment as complete package, low standby loss, no natural draft chimney required, and compact design. Complete specifications.

Iron Fireman Manufacturing Co.

505—Automatic Boiler-Burner Plant

Bulletin 4 describes the simplicity, easy maintenance, adoptability, and guaranteed field performance of the Highlander, two-pass, Scotch type boiler-burner plant. A general description is illustrated in line drawings to show construction and operation. Data for each model shown in tabular form.

Industrial Combustion Inc.

506—Packaged Hot Water Boilers

Type CC Superior packaged boilers designed for hot water operations and for capacities from 670,000 to 11,720,000 Btu/hr are described in this catalog. Burning gas, oil, or both, the Type CC is equipped with a venturi-action mixing tube which overcomes problems developing from improper boiler circulation.

Superior Combustion Industries, Inc.

507—Boiler Development Report

Bulletin AD 187 is a report covering the development of important features found in Cleaver-Brooks packaged boilers. The importance of specifying tested and field proven boilers is pointed out. Keyed illustration shows components of packaged boiler. Explains basic design, convenience, and operating safety.

Cleaver-Brooks Co.

508—Custom Built Equipment

Bulletin E-1 illustrates a wide range of custom built equipment. Includes steam generators, stills and towers, heat exchangers, reactors, oil chillers, crystallizers, and ice making and refrigeration equipment, which serve numerous applications in power plants, refineries, chemical plants, and related industries.

Henry Vogt Machine Co.

509—Discharge Silencers

Data Sheet D-180 describes Maxim hi-velocity discharge silencers to handle flows to atmosphere of steam, air, or gas from safety valves, gas turbines, and turbo-charged gas engines. Installation directions on three available models. Drawings show construction.

Maxim Division
American Machine & Foundry Co.

510—Hot Water Boilers

Bulletin HCC-2, a 20-page brochure, describes and illustrates the design, construction, advantages, and economies of the C-E LaMont controlled circulation hot water boiler for supplying high pressure, high temperature water for heating systems and process applications. Comparison table of heat content.

Combustion Engineering, Inc.

511—Diesel Engines

Bulletin DE-6 describes Alco 251 diesels. Available in three sizes, Six, Vee 12, and Vee 16 and ratings from 550 to 2400 hp. Cutaway of Vee model shown together with illustrations and descriptions of components. Diagrams of In-line 6, Vee 12, and Vee 16 with dimensions and specifications.

Alco Products, Inc.

512—Automatic Packaged Boilers

Bulletin 509B describes Johnston Brothers' packaged boilers. Fully automatic, factory assembled and fire tested. Oil, gas or combination oil/gas firing. Advantages given. Colorful cutaway shows operation. Firing equipment and accessories are described. Schematics show construction. Specifications, dimensions.

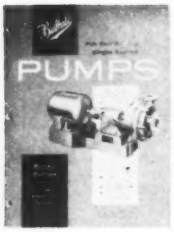
Johnston Brothers, Inc.

513—Rotary Burners

Bulletin describes Johnson Model 53 fully automatic, metering pump rotary burners. This burner insures smooth automatic starts even after lengthy shut downs. Will fire on oil only, gas only or combination oil and gas. Available in 9 sizes from 28 hp to 560 hp. Detailed dimensions given.

S. T. Johnson Co.

PUMPS & COMPRESSORS



514—Single Suction Pumps

Bulletin 976-G gives complete specifications on full ball bearing single suction pumps. Use includes handling saturated refrigerants and saturated liquids in air conditioning, viscous fluids in petrochemical and process industries, corrosive liquids when of alloy construction, and many others.

Buffalo Pumps Div., Buffalo Forge Co.

515—Packaged Condensing Unit

Bulletin C-460 describes an air-cooled complete package condensing unit. Union Compressor's compact, aluminum sheathed, light weight design gives low installation cost and maximum architectural flexibility. Operates year-round anywhere in the U. S. Features ease of servicing and freedom from corrosion.

Kramer Trenton Co.

516—Rotary Positive Blowers

Series 400 and 600 rotary positive blowers, gas pumps, and vacuum pumps are described in bulletin S-65C, including dimension drawings and cutaways. Volumes up to 20,000 cfm single stage with pressures to 10 psi or vacuums to 20 in Hg. Features anti-friction bearings and wide-face herringbone timing gears.

Sutorbilt Corp.

517—Vertical Turbine Pumps

Bulletin 9 describes *FlowWay* turbine pumps engineered and manufactured by Fiese & Firstenberger. Electric driven, belt driven, geared head, and combination gear and electric drive units are shown. Capacities start from 15 gpm to meet every pumping need. Cutaways show construction of built-in pumps.

Fiese & Firstenberger Mfg., Inc.

518—Rotary Compressors

Bulletin ACO-100 gives complete description and engineering details on new Fairbanks-Morse rotary positive displacement compressors, 6 frame sizes, 27 models available covering capacities 1000 cfm to 20,000 cfm. Ideal for process applications and other industrial uses. Cutaway shows construction.

Fairbanks, Morse & Co.

519—Turbine Power Plant Pumps

Bulletin 107A gives complete technical data on two-stage turbine power plant pumps. Includes details of construction, installation dimensions, range, applications, optional mechanical seals, and NPSH ratings. Also includes selection tables on pumps of capacities ranging from 5 gpm to 100 gpm, 100 to 800 ft tdh.

Roy E. Roth Co.

520—Manual of Pumping Problems

"How to Solve Pumping Problems," 36-page instruction manual, covers important fundamentals of estimating requirements of the average pumping job. It contains sample problems on hydraulic systems, general transfer, and pressure transfer, plus tables, charts, and other pertinent engineering data.

Roper Hydraulics, Inc.

521—Submersible Pumps

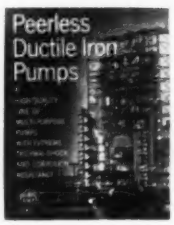
Bulletin B-259 describes the new design of the Super-Sumo submersible pump for 4" and larger wells. Designed for economy installations, the pump features bronze and stainless steel construction for corrosion resistance, long life, and maximum pumping capacity. Sizes from 1/3 hp to 1½ hp, capacities to 1700 gph.

Sumo Pumps, Inc.

522—Screw Pumps

Bulletins SE-5 and SI-6 describe line of screw pumps for heavy duty pumping of lubricating and nonlubricating fluids and semi-fluids, from 32 to 5,000,000 ssu; capacities 1 to 2000 gpm; discharge 1000 psi for viscous liquids, 500 psi for water. Internal or external bearing types, vertical or horizontal available.

Sier-Bath Gear & Pump Co., Inc.



523—Single and Multi-Stage Pumps

Bulletin B-1314 describes single and multi-stage pumps with resistance to thermal shock and corrosion. Single stage Type A pump, sizes of 4" and larger, capacities to 60,000 gpm, heads to 400 ft. Multi-stage Type TU and TUT, heads to 1500 ft, capacities of 3000 gpm.

Peerless Pump, Hydrodynamics Division Food Machinery & Chemical Corp.

524—Primary and Secondary Pumping

A completely automatic system for year round temperature control of a large multi-zoned building can present challenging design problems. A helpful solution "Zone Control with the B&G System of Primary and Secondary Pumping" is presented in an interesting 24-page design manual. Diagrams show systems.

Bell & Gossett Co.

525—Centrifugal Compressors

Bulletin 16 B 6048 C describes single-stage centrifugal compressors manufactured by Allis-Chalmers. Cutaways show component parts of each style compressor. Includes drawings and specifications on bearing arrangements, shaft seal arrangements, and impellers. Performance data includes graphs. Illustrated.

Allis-Chalmers.

PUMPS & COMPRESSORS *continued*

526—Centrifugal Air Compressors

Bulletin 4000-B1 describes Worthington's 4-stage, integral gear, centrifugal air compressors. Air inlet capacities from 4000 to 30,000 cfm, discharge pressures from 60 psig to 105 psig. Cutaway shows construction. The ten advantages of this compressor are described and illustrated. Various types of installations pictured.

Worthington Corp.

527—Vertical Turbine Pumps

Bulletin 1015 gives basic facts on vertical turbine pumps as developed by Johnston during the past 50 years. Descriptive data gives capacities, sizes, hp, power sources, and information on applications in agriculture, industry, and municipal use. Cutaway details of oil and water lubricated types plus callouts.

Johnston Pump Co.

528—Jet Apparatus

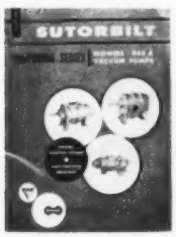
Bulletin J-1 describes the various kinds of jet apparatus manufactured by Schutte & Koerting for syphons, eductors, heaters, blowers, exhausters, compressors, scrubbers, condensers, pumps, and other types of equipment. Each application explained with cutaway drawings showing operation. Gives details.

Schutte & Koerting Co.

529—Cyclone Separator, Aftercooler

Bulletin 714 describes in detail the advantages and the use of the R. P. Adams cyclone separators and pipe line aftercoolers in maintaining clean, dry compressed air supplies. It is complete with engineering tables, color diagrams, and installation photographs which dramatically illustrate advantages.

R. P. Adams Co., Inc.



530—Pumps and Blowers

California series rotary positive, gas pumps and vacuum pumps are described in bulletin S-59H with dimension drawings and capacity tables. For volumes up to 2480 cfm single stage with pressures to 10 psi or vacuums to 20 in. Hg. Many features detailed.

Sutorbilt Corp.
Subsidiary of Fuller Co.

531—Pumps and General Services

Bulletin 100, condensed list of services pertaining to water well systems, pumps, drilling, allied services, and equipment. Includes water wells, oil and water lubricated vertical turbine pumps, well screens, special pumps for many uses, irrigation, special drilling, water treatment, and service work.

Layne & Bowler, Inc.

532—Submersible Pumps

Bulletin BJP-58-42 outlines engineering features and advantages, application techniques and installation photographs on the BJ line of submersible pumps. Municipal, agricultural, and industrial uses are shown with a listing of typical users and conditions of operation.

Byron Jackson Pumps, Inc.,
Subsidiary of Borg-Warner Corp.

533—General Service Pumps

Bulletin 100 gives complete data on the Weinman Type AC general service *Unipump* for pressure boosting service, hot and chilled water circulation, and other general pumping requirements. Bulletin includes drawings, dimensions, performance chart, and pump selection table for the many available models.

Weinman Pump Manufacturing Co.

534—Rotary Pumps

Catalog 61-S describes complete line of Viking positive displacement pumps in capacities from ⅛ to 1050 gpm for pressures up to 100 psi, heavy-duty construction and 500 psi for fuel oils, hydraulic oils, and others. Illustrations and specifications on this equipment and positive displacement rotary pumps.

Viking Pump Co.

535—Rubber Lined Pumps

Bulletin 981 describes features and advantages of all rubber-lined pumps. For use with many corrosive liquids including chlorinated brines, sodium chloride, Potassium chloride, brine slurries, hypochlorous acid, hydrochloric acid, chlorinated paper stock, caustic soda, hydrofluoric slurry, and others.

Buffalo Pumps Div., Buffalo Forge Co.

536—Thermobank Compressor

Bulletin TC-458 describes a complete high efficiency compressor and defrost system, featuring the fastest, most economical defrosting and greatest system economy. Exclusive *Thermobank* design prevents liquid return to compressor, eliminates oil foaming and delivers greatest Btu per connected kilowatt load.

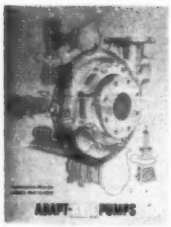
Kramer Trenton Co.

537—Vertical Pumps for Industry

Bulletin 14 describes some of the basic designs of *FlowWay* industrial pumps, job engineered for every industrial pumping problem. Cutaways detail construction of semi-open type and closed type impellers. Line drawing shows operation of various models. Components are illustrated and described.

Fiese & Firstenberger Mfg., Inc.

PUMPS & COMPRESSORS *continued*



538—ADAPT-ABLE Pumps

Bulletin APEB 250.12 describes Fairbanks-Morse ADAPT-*ABLE* pumps, which give a wide range of clear water, non-clog, and other liquid handling modifications. Pump frame dimensions align with NEMA motor frame dimensions for ease of mounting and trouble-free operation. Various types illustrated.

Fairbanks, Morse & Co.

540—Rotary Pumps

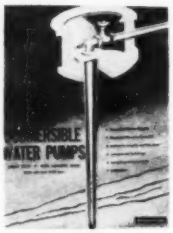
Catalog 958B contains detailed illustrations of several models in each of the five major series of Roper heavy-duty industrial pumps. Capacities, dimensions, performance and application data, and illustrated major features for each series are supplied. Roper custom pumps and pump-motors are also featured.

Roper Hydraulics, Inc.

539—Power Plant Pumps

Bulletin C107 gives everything needed by the engineer in his selection of power plant pump requirements up to 100 gpm and 800 ft tdh. Included in this 44 page bulletin is speed conversion ratios, performance curves, the NPSH formulae, and mechanical loading limits on two-stage turbine power plant pumps.

Roy E. Roth Co.



541—Submersible Water Pumps

Bulletin B1300 describes Sumo's industrial size submersible water pumps from 3 through 125 hp at 3550 and 1750 rpm. Heavy duty pumps used for municipal water supply and booster systems, industrial and commercial buildings, institutions, and irrigation. Features are pointed out in cutaway photograph.

Sumo Pumps, Inc.

SPECIAL SERVICES FOR ENGINEERS

542—Project Development

Brochure P-60 describes General Dynamics project development service available to consulting engineers. Covers control systems, systems management, propulsion systems, training devices, life support systems, metallurgy and chemistry, sound and vibration, and special products. Booklet is illustrated.

General Dynamics Corp.

543—Custom Engineering and Design

Booklet issued by General Dynamics describes the wide range of their experience ranging from nuclear power plants to training devices, from highly complex control systems to life-support systems for space craft. Covers engineering, design and manufacturing facilities, available to consulting engineers.

General Dynamics Corp.

STRUCTURAL MATERIALS & EQUIPMENT

544—Masonry Wall Reinforcement

Bulletin by Dur-O-waL describes wall reinforcement and *Rapid Control Joints*. Includes advantages, description, physical properties, section table, and general specifications for solid masonry wall construction. Line drawings show application. Drawings and specifications on both types of *Rapid Control Joints*.

Dur-O-waL.

545—Welded Steel Grating

Bulletin KSG-1-6-60 describes Kerrigan's *Weldforged* steel grating and treads. A concise, factual catalog. New arrangement of standard, close spaced, and tread data. Types for special applications located quickly. Complete tables on safe loads and weights. Specifying instructions. Installation photographs.

Kerrigan Iron Works Co.

STRUCTURAL MATERIALS & EQUIPMENT *continued*

546—Steel Deck

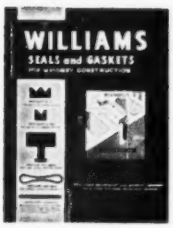
Catalog D-60 covering four steel deck sections, produced in a 24 in. and 12 in. module. Includes description, section property tables and load tables in bending and deflection, specifications, construction details, and other information on steel deck used as curtain walls, partitions, and permanent floor forms.

R. C. Mahon Co.

547—Curtain Wall Construction

Bulletin RVW 3-60 is a complete file kit with two pockets containing full information on both the *Bold-Line* and *Thin-Line* versatile wall systems. Described is the method of obtaining custom design versatility while using standard grids, panels, and sash. Includes reproducable scale details of components.

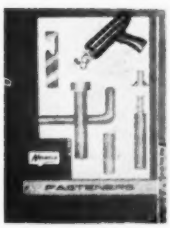
H. H. Robertson Co.



548—Seals and Gaskets

Four-page bulletin SG-659 covering complete line of *Weathertite* seals for various types of control joints in block constructed walls. It also covers masonry gaskets of nonabsorbent elastomer for use between sill and coping stones, brick or stone wall panels, and masonry and structural steel members.

Williams Equipment & Supply Co.



549—Stud Welding Equipment

The Consulting Engineer's file folder contains literature describing the use of Nelson stud welding equipment for concrete anchoring devices and other structural fasteners. Includes data on welded stud fasteners, concrete fasteners, and powder actuated fasteners. Illustrated.

Nelson Stud Welding Division, Gregory Industries, Inc.

550—Tracing Templates

Scale detailed drawings of horizontally hinged *spring-assisted* doors. Complete line includes roof scuttles, smoke hatches, ceiling access doors, floor doors, pit doors, and basement doors with steel stair stringers. Specifications, standard sizes, and weights included. Sales offices in this country and Canada listed.

BILCO Co.

551—Floor Gratings

Bulletin covers an improved conception for the installation of floor gratings, using the single-span divider-bar, combined with Borden's Type K reversible grating. Simplifies maintenance as well as installation. Bulletin pictures and describes installation at the new Public Service Generating Station, Linden, N. J.

Borden Metal Products Co.

552—High Strength Bearing Bolts

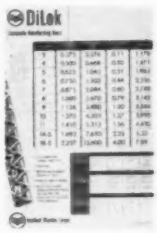
Engineering bulletin describes new high strength bearing bolt with highest sheer strength, greatest resistance to slip of all structural bolts. Advantages in design, in erection, and in structure outlined. Dimensions, comparison data, grip chart. Distributed by all Steel Service Centers of U. S. Steel Supply.

Lamson & Sessions Co.

553—Longer Concrete Floor Life

Bulletin MP-4d describes *Masterplate*, a metallic aggregate, which is dusted on the surface of freshly floated concrete to give an armored, wear-resistant surface. The many advantages are detailed and illustrated. Colors are available. Illustrations show many applications. Pictures show how to use.

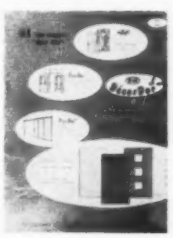
Master Builders Co.



554—Concrete Reinforcing Bars

Handy wall chart, ADUCO 14-14001, contains tables of weights and dimensions of USS *Di-Lok* bars for concrete reinforcing with an explanation of bar gradings. This wall chart is 13¾" x 21" is printed so as to be easily and quickly read. Has metal grommet for hanging on wall and reinforced envelope for mailing.

U. S. Steel Corp.



555—Metal and Wood Doors

Bulletin DHSV-60 describes the D & H *Decor-Dor* line of flush-design vinyl-on-steel, aluminum, and wood doors. Natural color illustrations show color and vinyl texture. Outstanding features of all models, construction, sizes, and types of doors included. Wood doors have *PyroDor* structural mineral cores.

Dusing & Hunt, Inc.

556—Masonry Reinforcements

The all new Sweet's brochure now available. AA Wire Products Company, manufacturers of masonry reinforcement and masonry ties, announce that the all new Sweet's brochure is now available. The new brochure features design drawings, photographs of installations, and suggested guide specifications.

AA Wire Products Co.

557—Service Fittings

Bulletin 493 illustrates design features, simplicity of assembly of new *Spang* service fittings, suitable for use with underfloor distribution systems of any manufacturer. Covers individual power and phone fittings and includes illustrations of linoleum, pan, terrazzo holder, plus part numbers, and ordering information.

National Supply Co.

STRUCTURAL MATERIALS & EQUIPMENT *continued*

558—Curtain Wall Systems

Catalog C-60 outlines Bayley aluminum or steel curtain wall systems and insulated panels with Bayley aluminum projected windows. Advantages of Bayley curtain walls include choice of distinctive wall treatment without cost of special design, a wall engineered to accommodate a building's movement.

William Bayley Co.

559—Prestressed Concrete Members

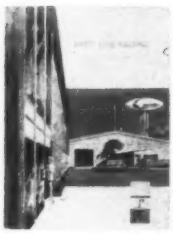
The rapid growth in the use of precast pretensioned bonded prestressed concrete members confirms their several advantages over competitive materials. Bulletin PC-945 describes application and productions, and covers buildings, bridges, piles, casting bed details, and tensioning data. Fully illustrated.

John A. Roebling's Sons Division.

560—*Multigrip* Floor Plate

Bulletin AUDCO 17002 quickly and simply describes and illustrates the advantages and applications of USS *Multigrip* floor plate. Directed to consulting engineers designing plants, shipyards, oil refineries, public works, and others, it clearly explains the safety, economy, and versatility of *Multigrip* applications.

U. S. Steel Corp.



561—Steel Buildings

Catalog B-2059 describes the new line of Armco steel buildings. Four basic types provide clear span widths ranging from a few feet to 120 feet. Many features include special durable metals. Catalog provides complete engineering data and specifications. Commercial and industrial installations in full color.

Armco Drainage & Metal Products, Inc.

562—Welded Steel Grating

New eight-page illustrated bulletin describes Gary welded steel grating and treads. Has easy-to-use table of safe loads, weights and symbols, and panel widths. Included is data on fastening devices illustrated by drawings. Information on specifying grating and tread.

Rockwell-Standard Corp., Grating Division.

563—Steel Roof Deck

Catalog 240 describes Inland's 5 broad lines of steel roof deck including new T-steel for spans to 32 feet. Included are features, section properties, load tables, construction details, installation procedures, and accessories. Information on *Acoustideck*, a roof deck and acoustical ceiling, is also presented.

Inland Steel Products Co.

564—Concrete Anchoring Systems

Bulletin F-200 describes Phillips Red Head concrete anchor system, the safest, surest way to anchor in concrete quickly. These self-drilling concrete anchors are available in all types and sizes. Each type is illustrated. Specifications in tabular form. Line drawings show installation procedures. Accessory tools shown.

Phillips Drill Co.

565—Reinforced Plastic Panels

Bulletin 1717RSF describes *Stylux*, the reinforced plastic panel, manufactured by Butler. Panels are used for commercial and industrial skylighting, window glazing, and ornamentation. Information especially for the use of consulting engineers includes specifications, product data, and installation details.

Butler Manufacturing Co.

566—Winter Protection for Concrete

Bulletin 2400 describes Horn *No-Freeze*, the multi-purpose admixture which provides winter protection for concrete and mortar.. Gives functions, laboratory reports, methods of application, and packaging. Includes data on proportions at temperatures from 15°F to 49°F.

A. C. Horn Companies, Div. Sun Chemical Corp.

567—Rolling Doors

Bulletin 104, 36 pages, is a complete catalog of the many types of doors made by Kinnear. It gives information on the types of operations, both manual and electrical; elevation drawings, mounting methods for various applications and locations; specifications; and explains special construction features of these doors.

Kinnear Manufacturing Co.

568—Vinyl-Coated Corrugated Steel

Catalog V-91 describes a new vinyl protected corrugated steel – Granco *Vin-Cor*. Used in industrial and commercial buildings of all types. Available in nine standard colors and a wide selection of gages and patterns. Full color catalog gives color selection, section properties, typical details, and specifications.

Granco Steel Products Co.

569—Chord Steel Joists

New 52-page bulletin contains complete data on Laclede straight chord steel joists, "S" and "L" Series. The bulletin includes numerous photographs, drawings and charts, plus such detailed information as design and construction features, dimensions and specifications, load and spacing tables, installation data.

Laclede Steel Co.

STRUCTURAL MATERIALS & EQUIPMENT *continued*

570—Cable, Wiring, Tubing Supports

Two systems of support for all types of cable, wiring, and tubing are described in a 28-page illustrated catalog. Systems are engineered to be used interchangeably, depending on the weight of the load to be supported at any location. *Globetray*, the ladder-type tray, and cable-strut, the basket type, described.

Globe Co.

571—Fluted Steel Foundation Piles

Catalog No. 91, 24 pages, contains information on physical properties and design features, standard weights and volumes of Monotube fluted, steel foundation piles. Included are photos of typical installations, test driving data, and other technical data of particular interest to consulting engineers.

Union Metal Manufacturing Co.

572—Trackless Turnover Doors

Bulletin BB-160 describes the new *Byrnover* door manufactured by Byrne Doors, Inc. This is a trackless turnover door that opens and closes twice as fast as other industrial doors. Requires minimum head and jamb clearance, has positive safety features, and provides cost advantages. All specifications listed.

Byrne Doors, Inc.

573—*Tensilform* for Floors or Roofs

Catalog WC-250-B describes features and gives technical data for Wheeling's permanent steel base for floor and roof slabs. Presents easy-to-use load tables, deflection charts, welding and clipping information, and suggested specifications. *Tensilform* has been designed to speed construction and permit early occupancy.

Wheeling Corrugating Co.

574—*Tru-Weld* Grating and Treads

Bulletin 1112, 12 pages, describes the characteristics of a new-type of steel industrial floor grating called *Tru-Weld*. Design, panel widths, and load tables for both the grating and treads, standard and close space, are detailed, along with specifications necessary for ordering. Applications are illustrated.

Dravo Corp.

575—Cellular Glass Acoustic

Bulletin GC-3 contains theory behind *Geocoustic* cellular glass acoustical material, its composition, ability to absorb and diffuse sound, and practicability of "patch" technique. Actual job photographs along with line drawings showing design possibilities. Data on size and availability of material.

Pittsburgh Corning Corp.

576—Steel Design Manual

First complete published manual containing design instruction for use of high strength steels. Includes fundamental characteristics, design considerations, working unit stresses, tension, compression, shear, deformation and deflection, formed sections, and design against corrosion. Engineering, not sales manual.

U. S. Steel Corp.

577—Steel Stair Treads

Tread-Grip steel stair treads combine strength of construction with safe, nonslip footing, according to four-page bulletin HTP2130. This brochure describes such features as *A. W. Algrip* nosing, electroforged and welded construction, and twisted cross bars. Included are detail drawings and dimensions.

Horace T. Potts Co.

578—Glass-Protected Smokestacks

Bulletin SS-202A describes *Permaglas* smokestacks, protected against corrosive flue gases. Features include longer life, low maintenance, lightweight, and easy installation. Chart shows how *Permaglas* stacks cost less over a period of years. Special *Permaglas* sections, smokestack accessories, and typical installations.

A. O. Smith Corp.

579—Silicones for the CPI

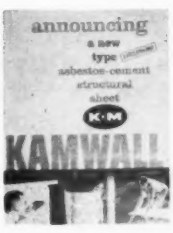
Manual 1-119 describes and illustrates weather and corrosive resistant silicone paints, masonry and concrete water repellents, insulator coatings, electrical insulation, all of the silicone materials of interest to consulting engineers working with the chemical processing industries. Completely illustrated.

Dow Corning Corp.

580—Cements and Bonding Compounds

Indexed price chart and data sheets describe the various types of cements and bonding compounds made by Sauereisen Cements Company. Charted, along with wholesale prices, is special industrial and technical data. Each sheet included describes a different type of adhesive or bonding compound. Illustrated.

Sauereisen Cements Co.



581—Asbestos-Cement Structural Sheet

Bulletin BM-231 describes "K&M" *Kamwall*, the first flexible and fireproof asbestos-cement structural sheet. "K&M" *Kamwall* can be stapled or nailed without pre-drilling, cut with an ordinary saw. The bulletin covers the features and suggested uses of "K&M" *Kamwall*, plus its physical properties.

Keasbey & Mattison Co.

STRUCTURAL MATERIALS & EQUIPMENT *continued*

582—Access and Inspection Doors

Manual 54-7 describes a new line of *Inspecdor* access and inspection doors. Square and rectangular shapes of varying standard and special sizes manufactured from heavy-duty stainless steel, chrome-plated steel, perma-coated steel, monel, or other materials. Specification and installation data.

Zurn Industries, Inc.

583—Duct Floors for Electrification

Sixteen-page booklet, "Electrical Outlets Wherever You Need Them," gives complete details on RLC duct floors, a new development which provides 100 percent electrical flexibility for buildings at a remarkably low cost. The illustrated booklet is published by the Concrete Steel Reinforcing Institute.

Concrete Steel Reinforcing Institute.

584—Electric-Welded Steel Tubing

This four-page file folder is printed in two colors and gives sizes, weights, and uses of Wheatland Electric-Welded Steel Tubing. Also check list of ordering information. Covers hot- and cold-rolled mechanical tubing, pre-dipped and hot-dipped galvanized. Illustrated and printed on heavy durable stock.

Wheatland Tube Co.

585—Precast Concrete Elements

Catalog HMM 2180 graphically describes the unusual custom design possibilities of Marietta's complete line of precast and prestressed concrete building elements. Complete information on application for large or small all-concrete industrial and commercial buildings.

Marietta Concrete Division
American-Marietta Co.

586—Cable and Tubing Support Systems

Chalfant Support system utilized for carrying instrumentation tubing, process tubing, piping, and control cables. Recommended for more economical, and faster installation over previous type systems. Completely pre-engineered and available with all accessories. Aluminum, galvanized steel and aluminized steel.

Chalfant Products Co.

587—All-Purpose Flooring Panels

Catalog 270 describes *Celluflor*, the new panel which serves as both structural sub-floor and cellular raceway for infloor electrification, communication, or heating systems. Includes load tables, section properties, construction and installation details, and specifications. Typical applications pictured.

Inland Steel Products Co.

588—Pressure Grouting Services

Brochure PGS-0002 describes Halliburton Pressure Grouting Services including equipment, personnel, and materials for any size grouting job, a dependable and convenient method of metering, mixing, placing grouting materials continuously. Selection of special chemical grouting fluids and cement grout slurries.

Halliburton Oil Well Cementing Co.

589—Metal Grating and Treads

General grating catalog F-400 contains illustrations, descriptions, and complete engineering data on grating flooring, treads, and floor armoring (riveted, press-locked, and welded types). Irving grating is safe, durable, fireproof, ventilating, clean, and economical for industrial and power plant flooring and stairways.

Irving Subway Grating Co., Inc.

590—"T-1" Steel Data

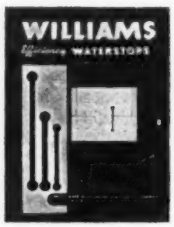
Booklet 01060 describes USS "T-1" steel, one of the most important members of the alloy family to appear on the scene in years. Contains cost comparisons, complete engineering data, metallurgical characteristics, fabrication practices, and applications. Profusely illustrated to show uses. Cuts costs, increases performance.

U. S. Steel Corp.

591—Structural Bolts

Catalog describes Lamson high strength bolts for buildings, bridges, towers, and other applications, that give maximum holding power. Bolting principles, ordering data, prices are included. Bolt is distributed by 20 U. S. Steel Supply Division Steel Service Centers in key locations throughout the country.

Lamson & Sessions Co.



592—Waterstops

Four-page bulletin WS-59 covering complete line of rubber, vinyl, and neoprene waterstops with molded accessories such as unions, ells, tees, and crosses – both flat and vertical. Includes properties and characteristics, recommendations for use, methods of installing in formwork, and suggested specifications.

Williams Equipment & Supply Co.

593—Metal Partitioning

Catalog 6015 gives full installation instructions for erecting metal partition panels in plants, using the *Quick-Erect* patented clips. Cut-away drawings for enclosing tool rooms, store rooms, separations, window guards, folding gates (Bostwick and Lazy Tong Types), and bins. Photographs of actual installations.

Globe Co., Products Division.

STRUCTURAL MATERIALS & EQUIPMENT *continued*

594—Expanded Metal Grating

Bulletin describes Grate-X, expanded metal grating manufactured by United States Gypsum. Various applications are illustrated. Especially designed for use as lightweight open steel flooring. Includes specifications, special sizes, ordering information, and selection guide. Load and deflection table, construction drawings.
United States Gypsum.

595—Rolling Steel Doors

Hand operated, mechanically operated, and power operated Underwriters' labeled and non-labeled rolling steel doors, grilles, and shutters to meet every door requirement are described and illustrated in 16-page catalog G59. Complete specifications are given for each type with drawings, dimensions.
R. C. Mahon Co.

To order personal copies of these bulletins, please fill out the card between pages 2 and 3 or 58 and 59.

596—Steel Roof Deck

Catalog D-601 describes and illustrates how flint-hard enamel finish resists abrasion and corrosion. Advantages, specifications, load-tables, illustrated details, and installation procedures also shown. Wide rib makes welding easy; provides strong working platform. Illustrated with photographs and line drawings.
Granco Steel Products Co.

597—Shear Connectors

Design Data describes the design and benefits of Nelson stud shear connectors for composite design of bridges and buildings. Types of shear connectors shown in line drawings. Bulletin includes installation photographs, tables, illustrative examples, and specifications.
Nelson Stud Welding Division,
Gregory Industries, Inc.

598—Sliding Fire Doors

Bulletin DHSL-60 describes Dusing & Hunt's new flush design sliding *Pyro-Dor*. This fire door has UL Class "A" 3 hr fire test rating plus lowest heat transmission rating. Built in sectional interlocking panels, these doors have solid mineral core construction. New *PyroMatic* door release.
Dusing & Hunt, Inc.

599—Wire Rope Catalog

A complete basic catalog for selecting wire rope for any use. Cross sections of different types of rope show construction. Rope diameters, breaking strength, and weight are given for all classifications. Well illustrated showing different uses. Wire rope fittings are illustrated.
American Steel & Wire Division,
United States Steel Corp.

600—Aluminum Grating

New six-page illustrated bulletin describes the basic advantages of Gary Super *Galok* Aluminum Grating. Outlines its industrial uses for stair treads and other uses decorative and functional. Included are easy-to-use tables of safe loads and weights, panel widths, types and sizes available.
Rockwell-Standard Corp., Grating Div.

601—New Ties for Masonry Walls

A new technical brochure features new anchors and ties for bonding modular masonry veneer to non-modular masonry backup. Also featured are nail-on anchors for anchoring masonry veneer to existing surfaces. Engineering drawings illustrate products use and specifications describe product application.
AA Wire Products Co.

602—Aluminum Windows

Catalog A-60 describes the complete line of Bayley aluminum windows, including original Bayley features. The booklet includes such items as projected windows, pivoted windows, class room windows, ribbon windows, and detention windows. Dimensions, construction, design, fasteners, materials, and finish.
William Bayley Co.

603—Electric and Air Subfloor

Catalog Q-54-60 describes the function, installation, and advantages of H. H. Robertson's *Q-Air Floor*, cellular-steel subflooring with raceways for heating and cooling as well as wiring. Construction details are included and details of accessories. Also contained are load and property tables and specifications.
H. H. Robertson Co.

604—Steel Tubing for Structural Use

Folder STR-60 introduces steel tubing for use as columns, beams, and other structural applications. Contains information on method of manufacture, types available, application photographs, and advantages. Complete size range of round, square, and rectangular shapes is included. Elements of sections shown.
Republic Steel, Steel and Tubes Division.

STRUCTURAL MATERIALS & EQUIPMENT *continued*

605—Non-Shrink Grouting

Bulletin E-le describes *Embeco®* the non-shrink grouting for machinery and equipment. A series of line drawings show some of the common methods of grouting. Cause of shrinking and why *Embeco®* does not shrink explained. Recommended mixes, estimating tables, preparation and mixing data included.

Master Builders Co.

606—Steel and Aluminum Grating

This 16-page catalog shows the three basic types of grating construction; gives more than 30 dimensional drawings of subtypes; eight safe load tables covering steel and aluminum grating, roadway grating, and sidewalk slabs; tables on panel widths, tread widths, and floor armor. Planning layouts are given.

Borden Metal Products Co.

607—Underfloor Distribution Systems

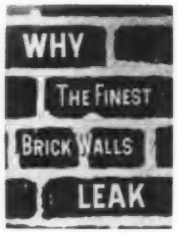
Bulletin 513 contains drawings, part numbers, and photographs of the three *Spang* duct systems for power, telephone, and intercom. Underfloor duct (for regular slab construction), headerduct (for cellular floors), and industrial duct (large capacity for heavy requirements in phone and intercom systems). Fittings described.

National Supply Co.

608—Concrete Anchoring Systems

File Folder F-259P contains literature describing features and applications of the Phillips Red Head self-drilling concrete anchor system. Graphically presents mode of installation and character of anchorage. Includes specifications, capacity ratings, test laboratory reports, fact sheets, and catalog.

Phillips Drill Co.



609—Why The Finest Brick Walls Leak

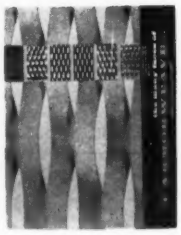
Bulletin fully explains and illustrates why even the finest brick walls leak. The corrective factors, measures to be taken, and Horn *Hydratite Plus,* the water repellent admixture for mortar, are fully described, together with its functions and methods of application.

A. C. Horn Companies,
Div. Sun Chemical Corp.

610—Aluminum Grating

Bulletin KA-160 describes a new kind of aluminum grating. New process permanently locks bars. No rivets, bolts, or screws. Contains illustrations and complete engineering data on grating and treads. Includes table of safe loads, weights and types, and panel width in inches. Three types of tread nosing.

Kerrigan Iron Works Co.



611—Decorative Expanded Metal

Bulletin IS-70 describes *Armorweave,* decorative expanded metal. Versatile, efficient, low cost sunshading material. Combines beauty and function so vital in building design. Some of *Armorweave's* many faces are illustrated. Pictures show various application possibilities. Inventive lighting produces dramatic night effects.

United States Gypsum.

612—Doors for Special Services

Catalog describes horizontally hinged *spring-assisted* access doors. Complete line includes roof scuttles, smoke hatches, ceiling access doors, flush floor doors, sidewalk doors, basement doors. Specification outlines materials, prices, and weights. Line drawings show operation. Sales offices listed.

BILCO Co.

613—Simple-Span Concrete Beams

Engineering data sheet PC-946 is entitled "Design Procedure for a Simple-Span Prestressed Concrete Beam." This technical bulletin is based on ACI-ASCE Committee 323 report "Tentative Recommendations for Prestressed Concrete." An excellent guide for engineers designing prestressed concrete members.

John A. Roebling's Sons Division.

614—Monopanl Walls

Bulletin 1728 is a data and specification form outlining, for the consulting engineer, product information and specifications on a new self-sealing insulated wall panel with no visible joints. Butler's new *Monopanl* forms a complete wall, inside and out, factory cut to fit a pre-engineered structural system. Details pictured.

Butler Manufacturing Co.

615—Foundation Pipe

Catolog FP-13358 describes three basic types of foundation pipe, pipe piles, caissons, and *Hel-Cor* pile shells for use under bridges, buildings, and other structures. Typical installations, dimensions, properties, and specifications are given. Data on pile driving hammers and pile bearing capacity.

Armco Drainage & Metal Products, Inc.

616—Rolling Counter Shutters

Bulletin 107 describes the Kinnear rolling counter shutters with midget slats. These metal shutters provide protection against weather, pilfering, or illegal entrance. Section views and diagrams show complete details and dimensional data. Manual or crank operated. Custom built to fit any opening.

Kinnear Mfg. Co.

WASTE DISPOSAL EQUIPMENT

617—Municipal Incinerators

Bulletin 1511 describes Dravo's incineration equipment based on the continuous flow principle. This equipment has a capacity of 12½ tons an hour, 300 tons a day. Illustrations show components and principle of operation. Line drawing shows layout of typical installation indicating flow of refuse.

Dravo Corp.

618—Treatment Tanks

Bulletin AET-59 contains full-color illustrations of water and effluent treatment tanks. They are steel-reinforced concrete structures faced on both sides with vitrified tile laid with corrosion-resistant mortar. Tanks are exceptionally attractive in appearance. Included are drawings showing wall construction.

Stebbins Engineering and Mfg. Co.

619—Packaged Sewage Pump Stations

Bulletin PS-60 describes the Tex-Vit packaged sewage pump station. Available in 50 to 2,000 gpm capacities, these are duplex units complete with motors, pumps, controls, dehumidifying unit, corrosion-resistant steel shell, and entrance tube. Bulletin includes engineering data, specifications, and dimensional drawings.

Tex-Vit Supply Co., Mfg. Division.

620—Small Plant Sewage Treatment

Bulletin 6692 describes Dorr-Oliver equipment for small plant sewage treatment which brings big plant results within the reach of the small community. Bulletin details the plant system; lists its many advantages; gives complete specifications. Photographs show installations and diagrams show equipment.

Dorr-Oliver, Inc.

621—Sewage Pumping Station

Complete engineering data manual on factory-bilt sewage pumping stations plus complete lineup of pneumatic ejector lift stations. Features design, operation, specifications, and selection data. Includes colorful bulletins on pump station, S&L sewage pump, and ejector stations. Full color cutaway shows components.

Smith & Loveless.

622—Sewage Treatment Plant

This data manual on the S&L "Oxigest" sewage treatment plant contains notes on design, engineering data, specifications, and installation instructions plus lists of accessory equipment. Now 27 standard sizes; factory-built units for small subdivisions, schools, motels, factories in need of dependable sewage treatment.

Smith & Loveless, Inc.

623—Sewage Flow Recorder

Bulletin 25 Seventh Edition illustrates and describes the Stevens Type B Series Recorders. Custom designed for each installation the Type B Recorder is available in models for recording level only or for recording, totalizing and indicating flow through flumes, weirs or other measuring structure.

Leupold & Stevens Instruments, Inc.

624—Sewage Lift Stations

Bulletin DJ-60 describes the *Delta-Ject* packaged pneumatic sewage lift station manufactured by Tex-Vit Supply Company, Manufacturing Division. A duplex unit available in 29 to 200 gpm, it features exclusive shell-within-shell design. Bulletin provides engineering data, specifications, and dimensional drawings.

Tex-Vit Supply Co., Mfg. Division.

625—Waste Treatment Equipment

Bulletin 4486 describes general types of industrial fluid wastes and equipment used for treatment and recovery. Diagrammatic illustrations cover typical waste treatment systems. Illustrates equipment for centrifuging, degasification, evaporation, filtration, ion exchange, precipitation and separation.

Pfaudler Permutit Inc.

626—High Capacity Aerator

Bulletin 7316 describes the D-O Aerator for application in both municipal sewage and industrial waste treatment plants. Can be adapted to a variety of tank sizes and is readily incorporated into existing tanks. Cutaways show aerators installed in round tank as well as in rectangular tank. Diagrams show flow.

Dorr-Oliver Inc.

627—Comminutor Selective Handbook

Bulletin 2129-B1 is a selection and application handbook of comminutors for sewage and industrial waste treatment. Shows sectional elevations. Gives factors to consider for comminutor selection in the modern sewage or industrial plant. Line drawings show how comminutor works. Typical channel designs shown.

Worthington Corp.

628—Oxidation-Type Sewage Plant

Bulletin 6520 describes the *Accelo-Biox®* complete oxidation-type plant for sewage treatment. Low per capita cost. Standardized equipment applications for installation in steel or concrete basins. Full range of sizes using either atmospheric or compressed air. Bulletin gives selection data and specifications.

Infilco Inc.

WATER TREATMENT EQUIPMENT

629—Automatic Control Systems

Bulletin E describes the automation of ion-exchange and water treatment equipment. A suggested specification is included, together with typical illustrations and descriptions of important design features. Automatic control systems described are adaptable to any automatic valve sequencing operation.

Illinois Water Treatment Co.

630—Aerators

Bulletin 5917 describes General Filter aerators, for the oxidizing of iron and removal of gases from water. The process of aeration is explained. Four types of aerators are listed with data given. Pictures of actual installations of various sizes and locations are featured. Complete specifications.

General Filter Co.

To order personal copies of these bulletins, please fill out the card between pages 2 and 3 or 58 and 59.

631—Industrial Diatomite Filters

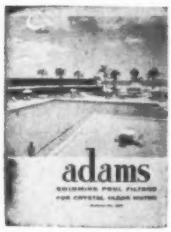
Bulletin 1670A describes Sparkler's Model RJ heavy duty, large volume, industrial water filters. Simply constructed for easy, fast servicing, and dependable operation. Complete general specifications are included. Photograph of Model RJ water filter points out features with line drawing inserts. Chart of capacities.

Sparkler Manufacturing Co.

632—Mixed-Bed Deionizers

Bulletin 512A describes single column mixed-bed deionizers that deliver chemically pure water (up to 18,000,000 ohm quality) free from all ionizable impurities including CO_2 and silica, at far less than distillation or evaporation cost. Line drawings show operation. Sheet enclosed gives technical data.

Elgin Softener Corp.



633—Swimming Pool Filters

New 24-page technical bulletin for consulting engineers on swimming pool filters for municipal, public, and institutional pools. Contains typical installations, cross-section and operational drawings, charts, and factual comparison. This manufacturer does not offer a filter for backyard type pools.

R. P. Adams Co., Inc.

634—Automatic Water Softeners

Bulletin 400A describes automatic water softeners for heavy duty service. Complete specifications are listed for 17 stock models, with installation diagrams and operation information included. Stock models in capacities up to 1.5 million grains, single unit; 3 million grains, twin unit. Flow rates are up to 175 gpm.

Bruner Corp.

635—Brinemakers

Bulletin B160A describes Morton's Model E Series brinemakers using the exclusive Morton *Fluitron.* Function, performance data, installation procedures, and operating instructions are included in this bulletin. Line drawing shows construction and operation. Component parts shown and named. Product photographs.

Morton Salt Co.

636—Water Works Brass Goods

Water works brass goods bulletin WW-58 illustrates and describes McDonald water service products. Included are curb stops, corporation stops, goosenecks, meter stops and couplings, service pipe couplings, and extension service boxes. Each product offered is pictured with description and necessary specifications.

A. Y. McDonald Mfg. Co.

637—Upflow Clarifiers

In bulletin 5811 models C, CP, CPS, P and CF of General Filter Company's upflow clarifiers are described and illustrated. Flow charts and important features, essential to economical and efficient operation, are included. Typical contraflo industrial, utility, and municipal installations are shown and described.

General Filter Co.

638—Water Demineralizers

Bulletin describes Carma de-ionizers and principal features such as the *Hydrotor* meter and multi-port valve. Points out the difference between distilled and demineralized water, uses for de-mineralized water, and standard Carma models available. Flow diagrams show how a de-ionizer works.

Carma Manufacturing Co.

639—Sodium Zeolite Water Softeners

Bulletin 4520-E describes Cochrane water softeners with the hydrmatic single control valve. Complete explanation includes flow rates, operating cycle, softening capicity, steps of operation, and details of construction. Cutaways show components and typical arrangement. Photographs of typical installations.

Cochrane Corp.

WATER TREATMENT EQUIPMENT *continued*

640—Water Control Equipment

Bulletin 315 illustrates and provides specifications for, the complete line of Sparling propeller-type main-line meters, recording instruments, and control equipment. Various applications, flow ranges, sizes, cut-away drawings, and installation information are all included. Pictured are production and test equipment.
Hersey-Sparling Meter Co.

641—Leveltrol System

Bulletin B659P describes a system for wet storage brinemaking which proportionately replaces water as brine is withdrawn. Permits accurate salt inventory; prevents overflow loss; eliminates corrosion of moving parts. Line drawings show different types of assemblies for different brine use systems.
Morton Salt Co.

642—Water Treatment Plant

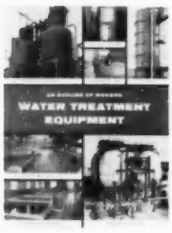
Bulletin 1870-B describes Infilco's water treating plant, *Accelapak®*, a complete package type for softening or clarification, and sterilization when required. Capacities from 15 to 350 gpm. Line drawing shows components. Design explained and illustrated with photographs and drawings. Schematics, tabular data.
Infilco Inc.

643—Water Stills

Catalog "H" describes Barnstead's complete line of water stills specially designed for hospital use. In capacities of from ½ gallon to 1000 gallons per hour and operated by steam, electricity, gas, and kerosene. Other models for double and triple distillation are also described in this useful catalog.
Barnstead Still & Sterilizer Co.

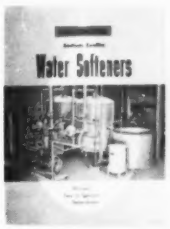
644—Ion Exchange Resins

Bulletin Z-5 (2nd edition) is a sixty page handbook for men who are responsible for water supplies. Included within is basic data on ways of conditioning water with Nalcite Ion Exchangers, and straight forward explanations on how you can figure costs and results using the various methods.
Nalco Chemical Co.



645—Water Treatment Equipment

Bulletin 4433 describes Pfaudler Permutit water treatment equipment. Includes information on typical systems, aerators, degasifiers, deaerators, chemical feeders, precipitation equipment, filters, and ion exchange equipment. Charts and tables show impurities, their causes, and methods of treatment. Illustrated.
Pfaudler Permutit Inc.



646—Water Softeners

Industrial sodium zeolite water softeners are discussed and illustrated in booklet 28B7107. Construction and operation of manual and automatic, single and multiple units are discussed and illustrated with cutaway views. A handy selection table provides information on capacity and specifications. Installation pictured.
Allis-Chalmers.

To order personal copies of these bulletins, please fill out the card between pages 2 and 3 or 58 and 59.

647—Water Filtration Equipment

Bulletin 804 describes new diatomite filter. Elements of woven wire and stainless steel coil support diatomite filter media and provide unrestricted flow. "Breather" action of elements cause instant release of spent diatomite and swirl flushout assures its complete removal Sand filters also described.
Elgin Softener Corp.

648—Diatomite Pressure Filters

Bulletin 2-323 covers the line of Bruner diatomite pressure filters for swimming pools. Standard filters are available in sizes from 12 to 672 sq ft. Features include a septum with interlocking plastic disc core and plastic cloth sleeve. Schematic diagrams and comparison charts for diatomite and sand filters.
Bruner Corp.

649—*Illco-Matic* Decarbonator

Bulletin D-160 describes a Decarbonator of unique design, which is used for removal of dissolved gases from water by aeration, without the use of a blower or compressed air. Features include low head room, package design, easy installation, and quiet, economical operation. Diagram shows operation.
Illinois Water Treatment Co.

650—Filters for Every Requirement

Bulletin 2204R describes Sparkler's standard models and custom engineered filters, made in over a hundred variations to conform to practically every filtering requirement. Cutaways of each model. Included are general specifications and capacity charts. Both horizontal plate and vertical plate filters are shown.
Sparkler Manufacturing Co.

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